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United States. Engineer Bureau.

30th Congress, 1st Session. [SENATE.] Executive, No. 7.

NOTES OF A MILITARY RECONNOISSANCE,

FROM

FORT LEAVENWORTH, IN MISSOURI,

TO

SAN DIEGO, IN CALIFORNIA,

INCLUDING PARTS OF THE

ARKANSAS, DEL NORTE, AND GILA RIVERS.

BY W. H. EMORY,

BREVET MAJOR, CORPS TOPOGRAPHICAL ENGINEERS.

MADE IN 1846-7, WITH THE ADVANCED GUARD OF THE "ARMY OF THE WEST."

WASHINGTON:
WENDELL AND VAN BENTHUYSEN, PRINTERS.
1848.

B. 4

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May 1913

WAR DEPARTMENT,
Washington, December 15, 1847.

SIR: In compliance with a resolution of the Senate of the 19th instant, requiring the Secretary of War to communicate to the Senate "a copy of notes of a military reconnoissance of the route from Fort Leavenworth, in Missouri, to San Diego, in California, by Lieutenant William H. Emory, of the topographical engineers, with a map of the said route and of the Arkansas, Del Norte, and Gila rivers; as also the report of Colonel P. St. George Cook's route to California, after diverging from the track of General Kearny," I have the honor to submit herewith a report from the colonel of the corps of topographical engineers, with the copies required by the resolution.

Very respectfully, your obedient servant,

W. L. MARCY,
Secretary of War.

HON. GEO. M. DALLAS,
President of the Senate.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, December 15, 1847.

SIR: In obedience to your orders, I have the honor to submit the report of First Lieutenant Emory, corps topographical engineers, of his reconnoissance of the route from Fort Leavenworth, in Missouri, to San Diego, in California, being a reply to a resolution of the Senate of the 9th instant; also the report and map of the route of Lieutenant Colonel Cook, being a deviation from the route followed by General Kearny, from the valley of the "Del Norte" to a point on the "Gila," called for by the same resolution.

I beg leave to remark that Lieutenant Emory's map, sent with his report, and founded, as the report will show, upon numerous, careful, and well digested astronomical observations, is the original. We have not had time to make a copy. I hope, therefore, that the original will be returned to the archives of this office, to which it belongs. A copy will be made in time for the engraver. This course will also afford opportunity to revise the map. There is one leading position, in reference to which the computers of observations disagree more than a minute in longitude. There is also danger, if the original goes into the hands of the artist, that it will be defaced and seriously injured.

The numerous sketches and drawings referred to in Emory's report are retained in the office, subject to the directions of the Senate. These are also originals, copies of which have not yet been made.

If the work should be printed, it may probably be advisable to have the map and sketches executed under the direction of this bureau, as in former instances.

Respectfully sir, your obedient servant,

J. J. ABERT,
Colonel Corps Topographical Engineers.

Hon. W. L. Marcy,
Secretary of War.

NOTES

OF

A MILITARY RECONNOISSANCE,

FROM

FORT LEAVENWORTH, IN MISSOURI, TO SAN DIEGO, IN CALIFORNIA,

INCLUDING

PARTS OF THE ARKANSAS, DEL NORTE, AND GILA RIVERS.

INSTRUCTIONS, AND EXPLANATORY REMARKS.

WASHINGTON, *September* 1, 1847.

To Col. J. J. ABERT,
Chief of the Corps of Topographical Engineers:

SIR: The following order was received by me June 5, 1846:

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, June 5, 1846.

SIR: You will repair, without delay, to Fort Leavenworth, and report yourself and party to Colonel Kearny, 1st dragoons, as field and topographical engineers of his command. In addition to yourself, the party will consist of—

First Lieutenant Warner, now at Washington.
Second Lieutenant Abert, do.
Second Lieutenant Peck.

Lieutenant Peck is at West Point, but he has been ordered to repair to St. Louis, and report to you at that place. Should Colonel Kearny be at St. Louis, which you will ascertain on passing through that place, you will report to him at St. Louis.

Although ordered to report as field and topographical engineers, under the regulations, you will not consider these in the light of exclusive duties, but will perform any military duty which shall be assigned to you by Colonel Kearny in accordance with your rank.

Should Colonel Kearny have moved on the prairies with his command, you will make every effort to overtake him.

Respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Topographical Engineers.

To Lieut. W. H. EMORY, *Top. Eng.*

Anticipating that the route of Colonel Kearny's command would be through unexplored regions, your suggestions required, that in all cases where it did not interfere with other and more immediate military demands of the service, the attention of myself, and the officers assigned to duty with me, should be employed in collecting data which would give the government some idea of the regions traversed.

The column commanded by Colonel Kearny, to which we were attached, styled "The Army of the West," to march from Fort Leavenworth, was destined to strike a blow at the northern provinces of Mexico, more especially New Mexico and California.

It was supposed we would barely reach Fort Leavenworth in time to join the army, and but twenty-four hours were allowed us in Washington to collect the instruments and other conveniences for such an expedition. This was quite sufficient for all the objects appertaining directly to our military wants, but insufficient for the organization and outfit of a party intended for exploration. In submitting the following notes, they should be received as observations made at intervals snatched from other duties, and with an expedition whose movements were directed by other considerations than those which would influence the views and conveniences of an explorer.

We left Washington on the 6th of June, unable to procure a pocket chronometer, or telescope of power sufficient to observe eclipses; but through your intercession, and by the kindness of the Chief of Hydrography, U. S. N., we were provided with two excellent box chronometers, No. 783 and No. 2075, by Parkinson and Frodsham, and we received from the bureau two of Gambey's 8½ inch sextants.

Crossing the Alleghanies the stage capsized with us, and placed the chronometers in great danger, but the prudence of Mr. Bestor, who carried them in a basket on his arm, saved them from destruction. Their rates were changed very materially by the accident, but subsequent observations showed no other injury had been incurred.

Elaborate observations for time and rate were made at St. Louis; from which place, being tolerably well established in geographical position, it was intended to carry the longitude by chronometer, but, on reaching Fort Leavenworth, the chronometers were again found to have changed their rates materially, owing to the peculiarly unsteady and jarring motion of the steamer upon which we ascended.

The meridian of Fort Leavenworth, as determined by Mr. Nicollet, is therefore taken as that to which all the determinations of longitude as far as Bent's fort, by the chronometer, are referred, and any change which subsequent observations may make in the longitude of Fort Leavenworth, will be common to them. The travelling rates of chronometer 783 were, as the observations will show, very uniform, and longitudes deduced from it, compared with direct measurements of lunar distances made at various points, give satisfactory comparisons as far as camp 70, October 9th, on the Rio del Norte. At this point we left the wagons, thence crossing the mountains to the Gila river, some irregularity in the rates is discoverable, until we reach camp 83, October 26th, on the Gila river.

From that point (camp 83) to San Diego, on the Pacific, the rates were very uniform. Assuming Captain Belcher's determination of San Diego, 7*h.* 48*m.* 44*s.*, west from Greenwich, and carrying my longitudes back, they compare well with the longitudes derived from the direct measurements of lunar distances made at different points on the route.

The longitude between the camps of October 9th and October 26th is derived from direct measurements, and from lunar distances.

Of the latitudes.

The latitudes were determined by measuring with one of the Gambey sextants the double altitudes of stars near the meridian, and at all important points by observations on north and south stars nearly as they could be obtained of equal altitudes. At these last points, where the observations are multiplied, their places may be depended upon to the nearest five seconds.

Of local time.

The local time was, in all cases, determined by altitudes of the heavenly bodies on different sides of the meridian.

The astronomical observations,   in number, were computed, in the first place, by myself and Mr. Bestor, and subsequently by Professor J. C. Hubbard. The results, as given in the appendix, are the final computations of Professor Hubbard, whose well-earned reputation as a computer entitles his work to entire confidence. These observations establish the geographical position of 52 points, extending from Fort Leavenworth to the Pacific, most of which lie in regions before undetermined.

Heights above the sea.

At Fort Leavenworth, through the liberality of the medical department, I was furnished with a syphon barometer, by Bunten, No. 515, the comparison of which, with the standard at Paris, is given in the subjoined note.

Observatoire —Comparison du baromètre à syphon, No. 515 de Bunten, *avec le baromètre* de l'observatoire.

Le baromètre No. 515, donne des hauteurs plus grandes que celles qui sont indiquées par le baromètre de l'observatoire, la différence est de 0 45 centièmes de millimètre.

Baromètre,	No. 515	759.19
	Observatoire	758.74
	Différence	+0.45

Baromètre de.

	L'observatoire.		No. 515.	
12.9	758.20	+0.40	758.60	12.5
12.0	761.50	+0.50	762.00	11.8
11.3	762.14	+0.56	762.70	11.0
10.3	758.06	+0.44	758.50	10.0
8.7	753.80	+0.35	756.15	8.8
		2.25		
		+0.45		

PARIS *le* 5 *Fevrier*, 1843.

GORYOZ.

The discussion of the data upon which the heights indicated by the barometer have been founded, would, if pursued, occupy some space; for the present, it will be sufficient to say that the basis of comparison, as far as Santa Fé, is a series of observations made at Fort Leavenworth, with the same instrument, running through two years; and the height of the hospital at Fort Leavenworth above the sea assumed at 912 feet.

From Santa Fé, down the Del Norte, and thence west as far as camp 83, of October 26th, the basis of comparison is the series of observations, running through two months, at Santa Fé.

From the camp of October 26th, on the Gila, the basis of comparison is the mean of the observations made at San Diego, on the Pacific, near the level of the sea. The barometer was left on the Pacific, under the charge of Lieutenant Warner, topographical engineers; and the further observations made with it on that coast will afford, at some future time, data upon which to reconsider the results now given, particularly those in the last section. In the absence of corresponding observations, the object has been to get a column of reference, progressing west, with the places observed at.

The formula used is that of Altman's. The heights deduced are marked on the map; but they should be considered, at best, but as near approximations to the truth.

The time of day at which the observations were made is not that which experience has shown to be best; but, the halts being beyond my control, I was compelled to yield to circumstances.

As far as Santa Fé, I received the assistance of Lieutenants J. W. Abert and G. W. Peck, of the corps of topographical engineers; both of whom had but too recently returned from an exploring expedition in less favored climates, and fell ill—the first at Bent's fort, and the last at Santa Fé.

From Santa Fé to the Pacific, I was aided by First Lieutenant W. H. Warner, of the topographical engineers, and Mr. Norman Bestor; all of whom deserve notice for the zeal and industry with which they performed their duty. Whilst with me, Lieutenant Peck made the topographical sketches; after he left, they were made by Lieutenant Warner.

I would here gladly avail myself of the opportunity of thanking Colonel Robert Campbell and Dr. Engelmann,* of St. Louis, for the disinterested and efficient aid they rendered us in St. Louis in our hurried preparations for a long and tedious journey. The advice given us by Colonel Campbell, a gentleman of great experience in prairie life, was felt beneficially to the last of the journey.

The country between Fort Leavenworth and Santa Fé, traversed by the army of the west, may be divided into three great divisions, distinct in character, climate, and products, viz: from Fort Leavenworth to Pawnee fork, from Pawnee fork to Bent's Fort, and from Bent's Fort to Santa Fé.

The two first divisions have been so often traversed, that I have omitted my diary embracing them, contenting myself with a few general remarks; but the scientific, and especially astronomical observations referring to them, are as full as in regard to the other regions.

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* An interesting account of the cacti observed on the route, furnished by Dr. Engelmann, will be found in Appendix No. 2, continued.

For the information of detachments moving on that route, a table of distances has been prepared; which, with the map, (though on rather too small a scale for military purposes,) may enable movements to be made without other guides.

Between Fort Leavenworth and Pawnee fork, the country is a high, rolling prairie, traversed by many streams, the largest of which is the Kansas, or "Kaw;" and all but this river may be forded, except during freshets.

The beds of the streams are generally deeply indented in the soil, and their banks almost vertical, developing, where the streams make their incisions in the earth, strata of fossiliferous limestone, of various shades of brown, filled with the remains of crinoidea.

On a branch of the Wah-Karrussi, where the Oregon trail strikes it, a seam of bituminous coal crops out. This is worked by the Indians, one of whom we met driving an ox-cart loaded with coal, to Westport. For the most part, the soil is a sandy loom, covered with rich vegetable deposite; the whole based upon a stratum of clay and limestone.

Trees are to be seen only along the margins of the streams, and the general appearance of the country is that of vast, rolling fields, enclosed with colossal hedges. The growth along these streams, as they approach the eastern part of the section under consideration, consists of ash, burr oak, black walnut, chesnut oak, black oak, long-leaved willow, sycamore, buck-eye, American elm, pig-nut hickory, hack-berry, and sumach; towards the west, as you approach the 99th meridian of longitude, the growth along the streams becomes almost exclusively cotton-wood. Council Grove creek forms an exception to this, as most of the trees enumerated above flourish in its vicinity, and render it, for that reason, a well known halting-place for caravans, for the repairs of wagons, and the acquisition of spare axles.

On the uplands the grass is luxuriant, and occasionally is found the wild tea and pilot weed.

As you draw near the meridian of Pawnee Fork, 99° west of Greenwich, the country changes, almost imperceptibly, until it merges into the arid, barren wastes described under that section. The transition is marked by the occurrence of cacti and other spinose plants, the first of which we saw in longitude 98°.

Near the same meridian the buffalo grass* was seen in small quantities, and, about noon, our party was cheered for the first time by the sight of a small "band" of buffalo, two of which we killed, at the expense of a couple of fine horses, which never recovered from the chase. Horses occasionally fed on grain become very weak feeding on grass alone, and should never in that condition be subjected to quick work. A violation of this precept has cost many volunteers their horses, and entailed trouble without end on many inexperienced travellers "westward bound." The next day immense herds of the buffalo were seen.

We were now on ground (see map of July 10th) which is traversed by the nomadic tribes of Pawnees, Sioux, Osages, and occasionally the Comanches. Their range is seldom farther east than Council Grove. The country thence, to the western borders of Missouri, is in the hands of Indians owing allegiance to, and receiving stipends from, the United States; they live in log-houses, cultivate the soil, rear cattle, and pursue some of the arts of peace. They form the connecting link between the savage of the plains and the white man of the States.

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*For a description of this famous grass, see Appendix No. 2.

The latitude of our camp, a few thousand feet southeast of where the road crosses the Pawnee Fork, is 38° 10′ 10″; and the longitude, by chronometer, is 98° 55′ 22″. The height above the sea, indicated approximately by the barometer, is 1,932 feet; the point, as will be seen on the map, is but a short distance from the junction of the Pawnee Fork and the Arkansas river.

The section of country embraced between this point and Bent's Fort is totally different in character from that just described, but the change is gradual, and may be anticipated from what has been said in reference to the appearance of the country so far east as the 98th degree, or even the 97th meridian.

The position of our camp near Bent's Fort, determined by 29 altitudes of Polaris and 35 circum-meridian altitudes of alpha aquilæ, is 38° 02′ 53″, and the longitude, by the measurement of distances between the moon and alpha aquilæ and alpha virginis, is 103° 01′, agreeing within 34*s*. with the chronometric determination of the same point.—(See Appendix.)

Our route from Pawnee Fork to this point was along the Arkansas river. The approximate height of Bent's Fort above the sea is 3,958 feet, and the height where we first struck the river, at the bend, is 1,658 feet, the distance between these two points being 311 miles, the fall of the river is about seven feet and four-tenths per mile. Its bed is of sand, sometimes of rounded pebbles of the primitive rock. It is seldom more than 150 yards wide, and, but for the quicksands, is everywhere fordable. The bottom land, a few feet above the level of the water, varies in width from half a mile to two miles, and is generally covered with good nutritious grass. Beyond this the ground rises by gentle slopes into a wilderness of sand hills on the south and into prairie on the north. There are one or two exceptions; for instance, at the great bend, the sand hills from the south impinge abruptly on the course of the river; at Pawnee rock, a long swell in the ground terminates in an abrupt hill of highly ferruginous sandstone; and ten miles above Chouteau's island, the hills along the river are vertical, as if the river had cut a passage through them; and, as you approach Bent's Fort, the hills generally roll in more boldly on the river, and the bottoms become narrower, and the grass more precious.

At these places the geological formation can be seen distinctly. On the lower part of the river it is a conglomerate of pebbles, sometimes shells cemented by lime and clay overlaying a stratum of soft sandstone, which in turn, overlays a blue shale, and sometimes the richest description of marl.

Higher up the river, we find the same formation, but in addition argillaceous limestone, containing ammonites and other impressions of shells in great variety, and in more than one instance distinct impressions of oyster shells. The dip in both cases about 6°, and a little north of east.

The soil of the plains is a granitic sand, intermixed with the exuviæ of animals and vegetable matter, supporting a scanty vegetation. The eye wanders in vain over these immense wastes in search of trees. Not one is to be seen. The principal growth is the buffalo grass, cacti in endless variety, and very rarely that wonderful plant, the Ipomea leptophylla, called by the hunter, man root, from the similarity of its root in size and shape to the body of a man. It is esculent, and serves to sustain human life in some of the many vicissitudes of hunger and privation to which men who roam the prairies, as an occupation, are subjected.

July 24—Near the dry mouth of the Big Sandy creek, the Yucca Angustifolia, palmillo of the Spaniards, or soap plant, first made its appearance, and marked a new change in the soil and vegetation of the prairies.

The narrow strip which I have described as the bottom land of the Arkansas, varying from half a mile to two or three miles wide, contains a luxuriant growth of grasses, which, by the judicious selection and distribution of the camps, sustained all the animals of the army of the west whilst on the river. The only tree of any magnitude found on its course is the cotton-wood, (Populus Canadensis,) and it frequently happens that not one of these is seen in a whole day's journey, and the buffalo dung and wild sage constitute the only fuel to be procured. About 35 miles before reaching Bent's Fort is found what is called the "big timber." Here the valley of the river widens, and the banks on either side fall towards it in gentle slopes. The "big timber" is a thinly scattered growth of large cotton woods not more than three-quarters of a mile wide, and three or four miles long. It is here the Chyennes, Arapahoes, and the Kioways sometimes winter, to avail themselves of the scanty supply of wood for fuel, and to let their animals browse on the twigs and bark of the cotton wood. The buffaloes are sometimes driven by the severity of the winter, which is here intense for the latitude, to the same place to feed upon the cotton-wood. To this point, which has been indicated to the government as a suitable one for a military post, Mr. Bent thinks of moving his establishment.

In addition to the grasses and cotton-wood mentioned, we find in the bottoms wild plum, wild cherry, willow, summer grape, cat tail, scouring rush, a powerful diuretic upon horses, Mexican poppy, and other plants, which will be found noted in appendix No. 2.

The animals of this section of the country are the buffalo, deer, antelope, elk, marmot, wolf, agama cornuta, &c.; but, for a more specific knowledge of the natural history of the region from Fort Leavenworth to Bent's Fort, reference is made to the interesting notes of one of my assistants, Lieutenant Abert, in appendix No. 6.

Except the buffalo, game is very scarce, and cannot be depended upon to support a party of men, however small their number.

The buffalo, where they range, may be relied upon to support a column of many thousand men; but their range is very uncertain. This year it was westward, between the 98th degree and the 101st meridian of longitude.

For an account of the country from Bent's Fort to the Pacific, I submit my notes, in which I have set down what passed under my own observation.

The accompanying map is also limited chiefly to the route followed, based upon the data exhibited in the appendices, and numbered from 3 to 5.

For a more specific knowledge of the plants peculiar to the country traversed than will be found in the journal, I refer to the catalogue prepared by that eminent botanist, Dr. John Torrey, to whom all the plants and drawings were submitted—forming appendix No. 2. The specimens brought home to aid me in elucidating the geology of the route, were submitted to Professor John Frazer, of the Pennsylvania University, to whose learning and knowledge I am under great obligation.

The military force under Colonel Kearny, destined for the conquest of New Mexico and the countries beyond, consisted of two batteries of artillery, (6-pounders,) under the command of Major Clark, three squadrons of the first dragoons, under Major Sumner, the first regiment of Missouri cavalry, under Colonel Doniphan, and two companies of infantry, under Captain Agney. This force was detached in different columns from Fort Leavenworth, and were concentrated with admirable order and precision on the 1st of August, at a camp nine miles below Bent's Fort.

And here I would take occasion to speak of the excellent understanding which prevailed throughout between regulars and volunteers, and the cheerfulness with which they came to each others assistance whenever the privations and hardships of the march called for the interchange of kindly offices among them. The volunteers, though but recently accustomed to the ease and comforts of smiling homes, bore up against fatigue, hunger, and the vicissitudes of a long and tedious march, through unexplored regions, with a zeal, courage, and devotion that would have graced time-worn veterans, and reflect the highest credit on their conduct as soldiers. There was a noble emulation in the conduct of regulars and volunteers, which, in no small degree benefitted the service; while, at the same time, it promoted that cordiality in their intercourse, which will make their future meetings, in the more peaceful walks of life, a gladsome event to both.

NOTES.

August 2, 1846.—I looked in the direction of Bent's Fort, and saw a huge United States flag flowing to the breeze, and straining every fibre of an ash pole planted over the centre of a gate. The mystery was soon revealed by a column of dust to the east, advancing with about the velocity of a fast walking horse—it was "the Army of the West." I ordered my horses to be hitched up, and, as the column passed, took my place with the staff.

A little below the fort the river was forded without difficulty, being paved with well attritioned pebbles of the primitive rock, and not more than knee deep.

We advanced five miles along the river, where its bed slides over a black, carbonaceous shale, which has been mistaken for coal, and induced some persons to dig for it.

Here we turned to the left, and pursued our course over an arid, elevated plain, for twenty miles, without water. When we reached the Timpas, we found the water in puddles, and the grass bad.

Colonel Doniphan was ordered to pursue the Arkansas to near the mouth of the Timpas, and rejoin the army by following the bed of that stream.

Near where we left the Arkansas we found, on the side of the slope, several singular demi-spheroids, about the size of an umbrella, coated with carbonate of lime, in pyramidal crystals, which, at a distance, resembled the bubbles of a huge boiling caldron.

Along the Arkansas the principal growth consists of very coarse grass, and a few cotton-woods and willows. The plains were covered with very short grass, Sesleria Dactyloides, now burnt to cinder, and artemisia.

The only animals seen were one black-tailed rabbit and an antelope; both of which were killed.

Our march was 26 miles, that of the army 37; the last 20 miles without water.

The artillery arrived in camp about 11, p. m.; both men and horses were parched with thirst. The teamsters, who had to encounter the dust, suffered very much. When water was near, they sprang from their seats and ran for it like mad men. Two horses sank under this day's march.

Our ascent was considerable to-day. The height, indicated by the barometer, being 4,523 feet above the level of the sea.

August 3.—We ascended the Timpas six and three-quarter miles, and halted for the day near running water; the grass was all burned dry, and not a green sprig to be seen. Three buttes were passed, of singular appearance; some idea of which will be given by the sketch. They were composed of limestone, and were garnished at their bases with nodules of carbonate of lime, like those described yesterday. A part of our road was on the dry bed of a river, paved with argillaceous limestone, containing, now and then, the impression of oyster shells very distinctly. The valley in which we encamped presented the appearance of a crater, being surrounded with buttes, capped with stunted cedar. The stratification, however, appeared regular, and to correspond on different sides of the valley.

The growth of to-day was similar to that found on the plains yesterday, to which may be added an evergreen and a magnificent cactus three feet high, with round limbs shaped like a rope, three and a half inches in diameter, branching at right angles. It is said the Mexicans make hedges of it.

Colonel Donipban's regiment passed our camp about 4, p. m.

The water was in pools, charged with vegetable matter and salt.

The formation of the adjacent hills was distinct; first, a stratum of lime-stone, ten feet thick, then hard sandstone, with ammonites and a variety of other shells, &c., overlaying blue marle. From the sides of the hills protruded geodes, with crystallized limestone, and the ground was everywhere strewed with detached pieces of ferruginous sandstone. On these hills we found cedar growing, very stunted; Missouri flax; several varieties of wild currants; a very stunted growth of plums; moss and cacti in great variety, but diminutive.

The latitude of this camp, by nine observations on Polaris, out of the meridian, is 37° 44′ 56″.

The longitude derived from the chronometer, by an estimate of the local time derived from eight measurements of the double altitude of Arcturus on the west, and seven of Alpha Aquilæ in the east, is 6*h*. 54*m*. 06.7*s*.

The barometer reading indicates a height above the sea of 4,761 feet.

August 4.—The road wound through the valley of the Timpas. The soil, being impregnated with lime, rendered the dust, which rose in dense columns, distressing.

Dwarfed cedar skirted the road on each side. The strata of hills on either side of the valley were the same as described yesterday; but the ferruginous nodules and blocks of sandstone were more frequent.

Thirteen miles' march brought us to the crossing of the Timpas. The only water we found there was in a hole 40 feet in diameter, into which the men rushed with great eagerness, disturbing the vegetable deposit formed on its surface, and thereby rendering it unfit for use. Nine miles further on we came to "the hole in the rock"—a large hole filled with stagnant, though drinkable, water.

We saw at times during the day a few antelopes, rabbits, wild horses, jack daws, meadow larks, and king birds. The pasture was so bad that Colonel Kearny determined to march to the "hole in the prairie," the neighborhood of which, though said to be destitute of water, affords some dry grass.

We passed a dead horse belonging to the infantry, black with crows, and a wolf in their midst, quietly feeding on the carcass. This gave us unpleasant forebodings for our noble, but now attenuated, horses.

We reached the "hole in the prairie" at 10, p. m., the distance being 14½ miles, and found grass, as we expected: we were agreeably surprised to find water also. The night was delicious, and all slept in the open air. The infantry were encamped here.

The total distance to-day was 36 miles. The horses were now falling away in an alarming manner, but the mules seem to require the stimulus of distention, and nothing else: this the dry grass affords.

On the march, about sunset, the Wattahyah (twin hills) rose suddenly to view, south 75° west; and then Pike's peak, 20 or 30 degrees farther to north. At the same time the dim outline of the great spine of the Rocky mountain chain began to show itself. We were now crossing the dividing line between the waters of the Timpas and those of the Purgatory, or Los Animos, of the Spaniards.

The vegetation was the same as that of yesterday, as far as we could judge from its burned and parched condition.

The height of this camp was found to be 5,560 feet.

August 5.—To-day we descended eleven and a half miles, and reached the valley of the Purgatory, called by the mountain men, Picatoire, a corruption of Purgatoire, a swift running stream, a few yards in width, but no grass of any amount at the crossing. The blighted trunks of large cotton-wood and locust trees were seen for many miles along its course, but the cause of decay was not apparent.

The growth of the bottom, which is very narrow, was black locust, the everlasting cotton-wood, willow, wild currants, hops, plum and grape, artemisia, clematis Virginiana, salix, in many varieties and a species of angelica, but no fruit was on the bushes. Beyond this stream five and a half miles, we encamped on the bed of a tributary to the Purgatory, which comes down from the north side of the Raton, or Mouse, which is the name given to a chain of ragged looking mountains that strikes the course of the Purgatory nearly at right angles, and separates the waters of the Arkansas from those of the Canadian. The banks of the Purgatory, where this stream debouches, begin to assume something of a mountain aspect, different from scenery in the States. The hills are bare of vegetation, except a few stunted cedars; and the valley is said to be, occasionally, the resort of grizzly bear, turkeys, deer, antelope, &c.

Passing the rear wagons of the infantry, we found their horses almost worn out, and the train followed by wolves.

Captain Cooke, of the 1st dragoons, was sent ahead the day before yesterday, to sound Armijo. Mr. Liffendorfer, a trader, married to a Santa Fé lady, was sent in the direction of Taos, with two Pueblo Indians, to feel the pulse of the Pueblos and the Mexican people, and, probably, to buy wheat if any could be purchased, and to distribute the proclamations of the colonel commanding.

Yesterday, Wm. Bent and six others, forming a spy-guard, were sent forward to reconnoitre the mountain passes. In this company was Mr. F. P. Blair, jr., who had been in this country some months, for the benefit of his health.

Measured 13 double altitudes of Polaris, in the north, for latitude, and 7 of Aquila, in the east, for local time, and the resulting latitude is 37° 12′ 10″, and longitude 6*h.* 56*m.* 48*s.* The height indicated by the barometer is 5,896 feet.

August 6.—Colonel Kearny left Colonel Doniphan's regiment and Major Clarke's artillery at our old camp-ground of last night, and scattered Sumner's dragoons three or four miles up the creek, to pass the day in renovating the animals by nips at the little bunches of grass spread at intervals in the valleys. This being done, we commenced the ascent of the Raton, and, after marching 17 miles, halted with the infantry and general staff, within a half mile of the summit of the pass. Strong parties were sent forward to repair the road, which winds through a picturesque valley, with the Raton towering to the left. Pine trees here obtain a respectable size, and lined the valley through the whole day's march. A few oaks, (Quercus Olivaformis,) big enough for axles, were found near the halting-place of to-night. When we first left the camp this morning, we saw several clumps of the pinon, (Pinus edulis.) It bears a resinous nut, eaten by Mexicans and Indians. We found also the Lamita in great abundance. It resembles the wild currant, and is, probably, one of its varieties; grows to the height of several feet, and bears a red berry, which is gathered, dried, pounded, and then mixed with sugar and water, making a very pleasant drink, resembling currant cordial. We were unfortunate in not being able to get either the fruit or flower. Neither this plant, the pinon, nor any of the plum trees, nor grape vines, had any fruit on them; which is attributable to the excessive drought. The stream, which was last year a rushing torrent, is this year dry, and in pools.

The view from our camp is inexpressibly beautiful, and reminds persons of the landscapes of Palestine. Without attempting a description, I refer to the sketch.

The rocks of the mountain were chiefly a light sandstone—in strata, not far from horizontal; and the road was covered with many fragments of volcanic rocks, of purplish brown color, porous, and melting over a slow fire.

The road is well located. The general appearance is something like the pass at the summit of the Boston and Albany railroad, bu the scenery bolder, and less adorned with vegetation.

An express returned from the spy-guard, which reported all clear in front. Captain Cooke and Mr. Liffendorfer have only reached the Canadian river. It was reported to me that, at Captain Sumner's camp, about 7 miles above where we encamped last night, and 12 miles from the summit, an immense field of coal crops out; the seam being 30 feet deep. To-night our animals were refreshed with good grass and water.

Nine observations on Polaris give, for the latitude of the place, 37° 00′ 21′.

Seven on Arcturus, in the west, and 7 on Alpha Aquilæ, in the east, give the chronometric longitude 6*h*. 57*m*. 01.35*s*.

Height above the sea, 7,169 feet.

August 7, *camp* 36.—We recommenced the ascent of the Raton, which we reached with ease, with our wagons, in about two miles. The height of this point above the sea, as indicated by the barometer, is 7,500 feet. From the summit we had a beautiful view of Pike's peak, the Wattahyah, and the chain of mountains running south from the Wattahyah. Several large white masses were discernible near the summits of the range, which we at first took for snow, but which, on examination with the telescope, were found to consist of white limestone, or granular quartz, of which we afterwards saw so much in this country. As we drew near, the view was no less imposing. To the east rose the Raton, which appeared still as high as from the camp, 1,500 feet below. On the top of the Raton the geological formation is very singular, presenting the appearance of a succession of castles. As a day would be required to visit it, I was obliged to forego that pleasure, and examine it merely with the glass. The mountain appears to be formed chiefly of sandstone, disposed in strata of various shades of color, dipping gently to the east, until you reach near the summit, where the castellated appearance commences, the sides become perpendicular, and the seams vertical. The valley is strewed with pebbles and fragments of trap rock, and the fusible rock described yesterday, cellular lava, and some pumice.

For two days our way was strewed with flowers; exhilarated by the ascent, the green foliage of the trees in striking contrast with the deserts we had left behind, they were the most agreeable days of the journey.

There is said to be a lake, about ten miles to the east of the summit, where immense hordes of deer, antelope, and buffalo congregate, but may be doubted.

The descent is much more rapid than the ascent, and, for the first few miles, through a valley of good burned grass and stagnant waters, containing many beautiful flowers. But frequently you come to a place where the stream (a branch of the Canadian) has worked itself through the mountains, and the road has to ascend and then descend a sharp spur. Here the difficulties commence; and the road, for three or four miles, is just passable for a wagon; many of the train were broken in the passage. A few thousand dollars judiciously expended here, would be an immense saving to the government, if the Santa Fé country is to be permanently occupied, and Bent's Fort road adopted. A few miles from the summit we reached a wide valley where the mountains open out, and the inhospitable looking hills recede to a respectable distance to the right and left. Sixteen miles from camp 36 brought us to the main branch of the Canadian, a slow running stream, discharging a volume of water the thickness of a man's waist. We found here Bent's camp. I dismounted under the shade of a cotton-wood, near an ant-hill, and saw something black which had been thrown out by the busy little insects; and, on examination, found it to be bituminous coal, lumps of which were afterwards found thickly scattered over the plain. After crossing the river, and proceeding about a mile and a quarter, I found the party from which I had become separated encamped on the river, with a plentiful supply of grass, wood, and water; and here we saw, for the first time, a few sprigs of the famous grama, (*Atheropogon Oligostachyum.*)

The growth on to-day's march was piñon in small quantities, scrub oak, scrub pine, a few lamita bushes, and, on the Canadian, a few cotton-wood trees; except at the camp, there was little or no grass. The evening threatened rain, but the clouds passed away, and we had a good night for observations. We have had no rain since we left Cow creeks, thirty days ago.

We are now in what may be called the paradise of that part of the country between Bent's Fort and San Miguel; and yet he who leaves the edge of the Canadian or its tributaries must make a good day's march to find wood, water, or grass.

There may be mineral wealth in these mountains, but its discovery must be left to some explorer not attached to the staff of an army making forced marches into an enemy's country.

To-day commenced our half-rations of bread; though not suffering for meat, we are anxious to seize on Santa Fé and its stock of provisions as soon as possible.

August 8.—We remained in camp all day to allow Colonel Doniphan's regiment and the artillery to come up. During the day, we had gusts of wind, and clouds discharging rain to the west. Captain Sumner drilled his three squadrons of dragoons, and made quite an imposing show.

The latitude of the camp is 36° 47′ 34″; the longitude 6*h*. 56*m*. 59.7*s*.

On the 7th, I measured 8 altitudes of Arcturus in the west, and 8 of Alpha Aquilæ in the east; and, on the 8th, 10 of Arcturus and 8 of Alpha Aquilæ—showing the rate of chronometer 783 to be losing 3*s*. per day.

The height determined approximately, is 6,112 feet above the sea.

August 9.—We broke up camp at 2½ o'clock, and marched with the colonel's staff and the first dragoons 10½ miles, and encamped under the mountains on the western side of the Canadian, on the banks of a small stream, a tributary of the Canadian. The grass was short, but good; the water in small quantities, and in puddles. Here we found a trap-dyke—course north 83 west—which shows itself also on the Canadian, about four miles distant, in the same course.

At the distance of six miles from last night's camp, the road forks—one branch running near the mountains to the west, but nearly parallel to the old road, and never distant more than four miles, and almost all the time in sight of it. The army was divided—the artillery, infantry, and wagon train ordered to take the lower, and the Missouri volunteers and first dragoons the upper road. The valley here opens out into an extensive plain, slightly rolling, flanked on each side by ranges of perpendicular hills, covered with stunted cedar and the piñon. In this extensive valley or plain may be traced by the eye, from any of the neighboring heights, the valleys of the Canadian and its tributaries, the Vermejo, the Poni, the Little Cimarron, the Rayada, and the Ocaté. We saw troops of antelopes, horses, deer, &c.; cacti in great abundane, and in every variety; also, a plant which Dr. De Camp pointed out as being highly balsamic; having collected quantities of it during his campaign to the Rocky mountains, and tested its efficacy as a substitute for Balsam Cop.

To-night we observed a great number of insects, the first remarked since leaving the Arkansas. Birds were equally rare, with the exception of the cow-bunting, which has been seen in great numbers on the whole route, and in a state so tame as to often alight on our horses. The horned frog (Agama Cornuta) also abounds here, as well as on the route westward from Chouteau's island.

August 10.—Colonel Kearny was dissatisfied with the upper road, and determined to strike for the old road. We did so after reaching the Vermejo, 9½ miles in a diagonal line, and rejoined it at the crossing of the Little Cimarron, where we found the infantry encamped—total distance 20½ miles. The grass good, and water plenty, though not flowing. Another trap-dyke, parallel nearly to the last, and three miles distant, presented its wall-like front. It was strewed with fragments of ferruginous sandstone and crystalized carbonate of lime.

A Mexican came into camp from Bent's Fort, and reported Lieutenant Abert much better. Colonel Kearny allowed him to pass to Taos, which place (60 miles distant by a bridle path) he expected to reach to-night. The colonel sent by him copies of his proclamation.

Five Mexicans were captured by Bent's spy company; they were sent out to reconnoitre our forces, with orders to detain all persons passing *out* of New Mexico. They were mounted on diminutive asses, and presented a ludicrous contrast by the side of the big men and horses of the first dragoons. Fitzpatrick, our guide, who seldom laughs, became almost convulsed whenever he turned his well practised eye in their direction.

Mr. Towle, an American citizen, came to head-quarters at the Vermejo, and reported himself just escaped from Taos. He brought the intelligence that, yesterday, the proclamation of Governor Armijo reached there, calling the citizens to arms, and placing the whole country under martial law; that Armijo has assembled all the Pueblo Indians, numbering about 2,000, and all the citizens capable of bearing arms; that 300 Mexican dragoons arrived in Santa Fé the day Armijo's proclamation was issued, and that 1,200 more were hourly expected; that the Mexicans, to a man, were anxious for a fight, but that half the Pueblo Indians were indifferent on the subject, but would be made to fight.

A succession of thunder storms passed yesterday to the north and west, but did not reach us. The ground indicates recent rain, as also does the grass, which looks as in the spring, just sprouting. The hills to the left, as near as I can judge, the same as in the Raton, were of different colored sandstone, regularly stratified, and dipping gently to the east, topped by a mural precipice of green stone. The growth on the mountains, piñon and cedar. On the plains, which are covered with scoriæ, scarcely a tree is to be seen.

We encamped on the Little Cimarron, and observed at night for latitude and time. 7 altitudes of Polaris give for the latitude 36° 27′ 50″; 7 on Arcturus in the west, and the same number on Alpha Aquilæ in the east, give the meridian by chronometer differences 6*h*. 58*m*. 39*s*. Approximate height 6,027 feet.

August 11.—We made a long march to-day with the advanced guard and the 1st dragoons, to the Ocaté, 31⅔ miles. The road approaches the Ocaté, at the foot of a high bluff to the north, where the river runs through a cañon, making it inaccessible to animals. We ascend the river for four or five miles, to where the road crosses; there we left the road, and at that point, the river being dry, continued to ascend it a mile, and found good grass, and, occasionally, running water. The scenery to-day was very pretty, sometimes approaching to the grand; the road passed through a succession of valleys, and crossed numerous "divides" of the Rayada and Ocaté. The Rayada is a limpid running stream, ten miles from the Little Cimarron, the first of the kind noted, though we have been traversing the bases of many mountains for days past. The pasture, however, is not good. At points two and four miles farther, at the foot of the mountains, there are springs and good grass. At the last point we overtook the infantry, where they halted. About five miles before reaching the Ocaté, the road descends into a valley, overhung by confused and rugged cliffs, which give promise of grass and water; but, on going down, we found that this beautiful valley had no outlet, but terminated in a salt lake. The lake is now dry, and its bed is white with a thin saline encrustation. Here the road is indistinct, and takes a sudden turn to the left. At this moment we discovered coming towards us, at full speed Bent's spy-guard. All thought they had met the enemy; I was ordered to ride forward to meet them, followed by Mr. Fitzpatrick and two dragoons. It proved to be a false alarm; they had missed their road, and were galloping back to regain it.

The hills are composed principally of basalt and a porous volcanic stone, very hard, with metallic fracture and lustre, traversed by dykes of trap. The lava is underlayed by sandstone. From the uniform height of these hills, one would think they originally formed the table land, and that the valleys had been formed by some denuding process, and their limits determined by the alternate existence or non-existence of the hard crust of volcanic rocks.

Matters are now becoming very interesting. Six or eight Mexicans were captured last night, and on their persons was found the proclamation of the Prefect of Taos, based upon that of Armijo, calling the citizens to arms, to repel the "Americans, who were coming to invade their soil and destroy their *property and liberties*;" ordering an enrolment of all citizens over 15 and under 50. It is decidedly less bombastic than any Mexican paper I have yet seen. Colonel Kearny assembled these prisoners, altogether some ten or twelve, made a speech to them, and ordered that, when the rear guard of the army should have passed, they should be released. These men were not deficient in form or stature; their faces expressed good nature, bordering on idiocy; they were mounted on little donkies and jennies, guided by clubs instead of bridles.

Two more Mexicans, of a better class, were captured to-night, or rather they came into camp. Their story was, that they had come out by order of the alcalde of the Moro town to look out for their standing enemies, the Eutaws, who were reported in the neighborhood. That they had heard of our advance some time since, but believed us to be at the Rayada, 22 miles back; but seeing our wagons, and having faith in the Americans, they rode without hesitation into our camp. When they said they had faith in us, the colonel ordered them to shake hands with him. They were ordered to be detained for a day or two, for it was quite evident to all they were spies, who had come too suddenly into the little ravine in which we were encamped.

They appeared well pleased, and one of them, after proceeding a few steps with the guard, turned back and presented the colonel with a fresh cream cheese.

The grass was interspersed with a great variety of new and beautiful flowers, &c., &c. The hills were sparsely covered with cedar and piñon. Antelopes and horned frogs in abundance, but no other animals were seen.

Height of this camp 6,946 feet.

August 12.—The elder Mexican was discharged, giving him two proclamations; one for the alcalde, another for the people of his town. A message was sent to the alcalde to meet us at the crossing of the Moro, with several of his chief men. The other Mexican was retained as a guide. About 12 o'clock the advance was sounded, and the colonel, with Sumner's command, marched 20 miles, and halted in a beautiful valley of fine grass and pools of cool water, where the wild liquorice (Glycyrrhiza Lepidota) grew plentifully. The stream, where flowing, is a tributary of the Moro.

From the drift wood, &c., found in its wide, well-grassed bed, I infer it is subject to great freshets. In crossing from the Ocaté to the valley of the Moro, the mountains become more rolling; and as we approached the Moro, the valley opened out, and the whole country became more tame in its appearance.

Ten miles up the Moro is the Moro town, containing, we were informed, 200 houses.

It is off the lower road; but a tolerable wagon road leads to the village from our camp of last night.

The plains were strewed with fragments of brick-dust colored lava, scoriæ and slag; the hills, to the left, capped with white granular quartz. The plains are almost destitute of vegetation; the hills bear a stunted growth of piñon and red cedar. Rains have fallen here recently, and the grass in the bottoms is good. The grama is now found constantly. We saw to-day some ground squirrels, with stripes on their sides: in their habits, resembling the common prairie dog. A flight of birds was seen to the south, but too distant to distinguish. We were attracted to the left by an object which was supposed to be an Indian, but, on coming up to it, it was discovered to be a sandstone block standing on end and topped by another shorter block. A mountain man, versed in these signs, said it was in commemoration of a talk and friendly smoke between some two or three tribes of Indians.

The latitude of the place, from 7 observations on Polaris, is 35° 54′ 21″, and the longitude, deduced from the local time by 7 altitudes of alpha lyræ in the west, and 11 of the sun in the east, was 6*h*. 59*m*. 49*s*.

The height above the sea 6,670 feet.

August 13.—At 12 o'clock, as the rear column came in sight, the call of "boots and saddles" was sounded, and in 20 minutes we were off. We had not advanced more than one mile when Bent, of the spy-guard, came up with four prisoners. They represented themselves to be an ensign and three privates of the Mexican army, sent forward to reconnoitre and ascertain our force. They said 600 men were at the Vegas to give us battle. They told many different stories; and finally delivered up a paper, being an order from a Captain Gonzales to the ensign, to go forward on the Bent's Fort road to ascertain our position and numbers. They were cross-examined by the colonel, and detained.

As soon as we commenced the descent into the valley of the Moro creek, some one reported a company of Mexicans at the crossing; Colonel Kearny ordered me to go forward with twelve of the Laclède rangers, and reconnoitre the party, and if they attempted to run, to pursue and capture as many as we could. As Lieutenant Elliot and myself approached this company, they appeared to be motionless, and on coming up, we found them to consist of nothing but the pine stakes of a corrál. The dragoons were sadly disappointed; they evidently expected either a fight or a chase. Six miles brought us to the first settlement we had yet seen in 775 miles. The first object I saw was a pretty Mexican woman, with clean white stockings, who very cordially shook hands with us and asked for tobacco. In the next house lived Mr. Boney, an American, who has been some time in this country, and is the owner of a large number of horses and cattle, which he manages to keep in defiance of wolves, Indians, and Mexicans. He is a perfect specimen of a generous open-hearted adventurer, and in appearance what, I have pictured to myself, Daniel Boone, of Kentucky, must have been in his day. He drove his herd of cattle into camp and picked out the largest and fattest, which he presented to the army.

Two miles below, at the junction of the Moro and Sapillo, is another American, Mr. Wells, of North Carolina; he has been here but six months, and barring his broad-brimmed sombrero, might have been taken for a sergeant of dragoons, with his blue pantaloons with broad gold-colored stripes on the sides, and his jacket trimmed with lace. I bought butter from him at four bits the pound.

We halted at the Sapillo, distance nine and a half miles from our last night's encampment, in a tremendous shower of rain; the grass was indifferent, being clipped short by the cattle from the rancheria. Wood and water plenty.

At this place a Mr. Spry came into camp, on foot, and with scarcely any clothing. He had escaped from Santa Fé on the night previous, at Mr. H——'s request, to inform Colonel Kearny that Armijo's forces were assembling; that he might expect vigorous resistance, and that a place called the Cañon, 15 miles from Santa Fé, was being fortified; and to advise the Colonel to go round it.

The cañon is a narrow defile, easily defended, and of which we have heard a great deal. War now seems "inevitable;" and the advantages of ground and numbers will, no doubt, enable the Mexicans to make the fight interesting. The grass was miserable, and the camp ground inundated by the shower of to-day—which was quite a rarity.

Barometric height 6,395 feet.

August 14.—The order of march to-day was that which could easily be converted into the order of battle. After proceeding a few miles we met a queer cavalcade, which we supposed at first to be the looked for alcalde from Moro town, but it proved to be a messenger from Armijo; a lieutenant, accompanied by a sergeant and two privates, of Mexican lancers. The men were good looking enough, and evidently dressed in their best bib and tucker. The creases in their pantaloons were quite distinct, but their horses were mean in the extreme, and the contempt with which our dragoons was filled was quite apparent. The messenger was the bearer of a letter from Armijo. It was a sensible, straightforward missive, and if written by an American or Englishman, would have meant this: "You have notified me that you intend to take possession of the country I govern. The people of the country have risen, en masse, in my defence. If you take the country, it will be because you prove the strongest in battle. I suggest to you to stop at the Sapillo, and I will march to the Vegas. We will meet and negotiate on the plains between them."

The artillery were detained some time in passing the Sapillo.

This kept us exposed to the sun on the plains for four hours, but it gave the colonel time to reflect on the message with which he should dismiss the lancers; as there was some apprehension that Captain Cooke was detained, their discharge became matter for reflection. Sixteen miles brought us in sight of the Vegas, a village on the stream of the same name.

A halt was made at this point, and the colonel called up the lieutenant and lancers and said to them, "The road to Santa Fé is now as free to you as to myself. Say to General Armijo, I shall soon meet him, and I hope it will be as friends."

At parting, the lieutenant embraced the colonel, Captain Turner, and myself, who happened to be standing near.

The country to-day was rolling, almost mountainous, and covered in places with scoriæ. Grass began to show itself, and was interspersed with Malva Pedata, and several new species of Geraniaceæ, Bartonia, and convolvulus. The soil was good enough apparently, but vegetation was stunted from the want of rain. As we emerged from the hills into the valley of the Vegas, our eyes were greeted for the first time with waving corn. The stream was flooded, and the little drains by which the fields were irrigated, full to the brim. The dry soil seemed to drink it in with the avidity of our thirsty horses. The village, at a short distance, looked like an extensive brick-kiln. On approaching, its outline presented a square with some arrangements for defence. Into this square the inhabitants are sometimes compelled to retreat, with all their stock, to avoid the attacks of the Eutaws and Navajoes, who pounce upon them and carry off their women, children, and cattle. Only a few days since, they made a descent on the town and carried off 120 sheep and other stock. As Captain Cooke passed through the town some ten days' since, a murder had just been committed on these helpless people. Our camp extended for a mile down the valley; on one side was the stream, on the other the cornfields, with no fence or hedge interposing. What a tantalizing prospect for our hungry and jaded nags; the water was free, but a chain of sentinels was posted to protect the corn, and strict orders given that it should not be disturbed.

Captain Turner was sent to the village to inform the alcalde that the colonel wished to see him and the head men of the town. In a short time down came the alcalde and two captains of militia, with numerous servants, prancing and careering their little nags into camp.

Observations.—9 altitudes of Polaris in the north, 7 of Arcturus in the east, and 7 of alpha Aquilæ in the east.

Latitude 35° 35′ 05″.

Longitude 7*h*. 00*m*. 46*s*.

Height, by the barometer, 6,418 feet.

August 15.—12 o'clock last night information was received that 600 men had collected at the pass which debouches into the Vegas, two miles distant, and were to oppose our march. In the morning, orders were given to prepare to meet the enemy. At 7, the army moved, and just as we made the road leading through the town, Major Swords, of the quartermaster's department, Lieutenant Gilmer, of the engineers, and Captain Weightman joined us, from Fort Leavenworth, and presented Colonel Kearny with his commission as brigadier general in the army of the United States. They had heard we were to have a battle, and rode sixty miles during the night to be in it.

At eight, precisely, the general was in the public square, where he was met by the alcalde and people, many of whom were mounted; for these people seem to live on horseback.

The general pointed to the top of one of their houses, which are built of one story, and suggested to the alcalde that if he would go to that place, he and his staff would follow, and, from that point, where all could hear and see, he would speak to them; which he did, as follows:

"Mr. Alcalde, and people of New Mexico: I have come amongst you by the orders of my government, to take possession of your country, and extend over it the laws of the United States. We consider it, and have done so for some time, a part of the territory of the United States. We come amongst you as friends—not as enemies; as protectors—not as conquerers. We come among you for your benefit—not for your injury.

"Henceforth I absolve you from all allegiance to the Mexican government, and from all obedience to General Armijo. He is no longer your governor; [great sensation.] I am your governor. I shall not expect you to take up arms and follow me, to fight your own people, who may oppose me; but I now tell you, that those who remain peaceably at home, attending to their crops and their herds, shall be protected by me, in their property, their persons, and their religion; and not a pepper, not an onion, shall be disturbed or taken by my troops, without pay, or by the consent of the owner. But listen! he who promises to be quiet, and is found in arms against me, I will hang!

"From the Mexican government you have never received protection. The Apaches and the Navajoes come down from the mountains and carry off your sheep, and even your women, whenever they please. My government will correct all this. It will keep off the Indians, protect you in your persons and property; and, I repeat again, will protect you in your religion. I know you are all great Catholics; that some of your priests have told you all sorts of stories—that we should ill-treat your women, and brand them on the cheek as you do your mules on the hip. It is all false. My government respects your religion as much as the Protestant religion, and allows each man to worship his Creator as his heart tells him is best. Its laws protect the Catholic as well as the Protestant; the weak as well as the strong; the poor as well as the rich. I am not a Catholic myself—I was not brought up in that faith; but, at least one-third of my army are Catholics, and I respect a good Catholic as much as a good Protestant.

"There goes my army—you see but a small portion of it; there are many more behind—resistance is useless.

"Mr. Alcalde, and you two captains of militia, the laws of my country require that all men who hold office under shall take the oath of allegiance. I do not wish, for the present, until affairs become more settled, to disturb your form of government. If you are prepared to take oaths of allegiance, I shall continue you in office, and support your authority."

This was a bitter pill; but it was swallowed by the discontented captain, with downcast eyes. The general remarked to him, in hearing of all the people: "Captain, look me in the face, while you repeat the oath of office." The hint was understood—the oath taken, and the alcalde and the two captains pronounced to be continued in office. The people were enjoined to obey the alcalde, &c., &c. The citizens grinned, and exchanged looks of satisfaction, but seemed not to have the boldness to express what they evidently felt—that their burdens, if not relieved, were, at least, shifted to some ungalled part of the body.

We descended by the same rickety ladder by which we had climbed to the tops of the houses, mounted our horses, and rode briskly forward to encounter our 600 Mexicans in the gorge of the mountains, two miles distant.

The sun shone with dazzling brightness; the guidons and colors of each squadron, regiment, and battalion, were for the first time unfurled. The drooping horses seemed to take courage from the gay array. The trumpeters sounded "to horse," with spirit, and the hills multiplied and re-echoed the call. All wore the aspect of a gala day; and as we approached the gorge, where we expected to meet the enemy, we broke into a brisk trot, then into a full gallop, preceded by a squadron of horse. The gorge was passed, but no person seen.

One by one the guidons were furled; the men looked disappointed, and a few minutes found us dragging our slow lengths along, with the usual indifference in regard to every subject, except that of overcoming space.

Two miles further brought us to another pass, as formidable as the first, and all the intermediate country was broken, and covered with a dense growth of pine, piñon, and cedar. Here the mountains begin to rise to the height of a thousand feet above the road. Nine miles more, brought us to Tacoloté.

Here we met the alcalde and the people, in the cool and spacious residence of the former, where the drama just described, was again enacted. This time it was graced by the presence of the women, with their bare ankles, round, plump arms, and slippered feet.

We marched ten miles farther, to the Vernal springs, and halted at the upper spring, and observed for time and latitude about 500 feet south of the upper spring.

Observed 9 altitudes of Polaris, 7 of Alpha Aquilæ, and 7 of Arcturus. Latitude 35° 23′ 19″, longitude 7*h*. 01*m*. 23*s*.

Height indicated by the barometer 6,299 feet.

August 16—We marched to San Miguel, where General Kearny assembled the people and harangued them much in the same manner as at the Vegas.

Reports now reached us at every step that the people were rising, and that Armijo was collecting a formidable force to oppose our march at the celebrated pass of the cañon,*15 miles from Sante Fé. About the middle of the day's march the two Pueblo Indians, previously sent in to sound the chief men of that formidable tribe, were seen in the distance, at full speed, with arms and legs both thumping into the sides of their mules at every stride. Something was now surely in the wind. The smaller and foremost of the two dashed up to the general, his face radiant with joy, and exclaimed, "they are in the Cañon, my brave, pluck up your courage and push them out." As soon as his extravagant delight at the prospect of a fight, and the pleasure of communicating the news, had subsided, he gave a pretty accurate idea of Armijo's force and position.

The road passed over to-day was good, but the face of the country exceedingly rugged, broken, and covered with piñon and cedar. To the left, one or two miles distant, towers a wall, nearly perpendicular, 2,000 feet high, apparently level on the top, and showing, as near as I could judge from the road, an immense stratum of red earth.

We turned from the road to the creek, where there were a few rancherias, to encamp; at which place we passed an uncomfortable night, the water being hard to reach, and the grass very bad.

Barometic height 6,346 feet.

August 17—The picket guard, stationed on the road, captured the son of Saliza, who, it is said, is to play an important part in the defence of this country, and the same who behaved so brutally to the Texan prisoners. The son was at San Miguel yesterday, and heard from a concealed place all that passed. It is supposed, at this time, he was examining the position, strength, &c., of our army to report to his father.

A rumor has reached camp that the 2,000 Mexicans assembled in the Cañon to oppose us, have quarrelled among themselves; that Armijo, taking advantage of the dissensions, fled with his dragoons and artillery to the south. He has long been suspected of wishing an excuse to fly. It is well known he has been averse to a battle, but some of his people threatened his life if he refused to fight. He has been, for some days, more in fear of his own people than of the American army. He has seen what they are blind to; the hopelessness of resistance.

As we approached the ruins of the ancient town of Pecos, a large fat fellow, mounted on a mule, came towards us at full speed, and extending his hand to the general, congratulated him on the arrival of himself and army. He said, with a roar of laughter, "Armijo and his troops have gone to hell, and the Cañon is all clear." This was the alcalde of the settlement, two miles up the Pecos from the ruins, where we encamped, 15¾ miles from our last camp, and two miles from the road.

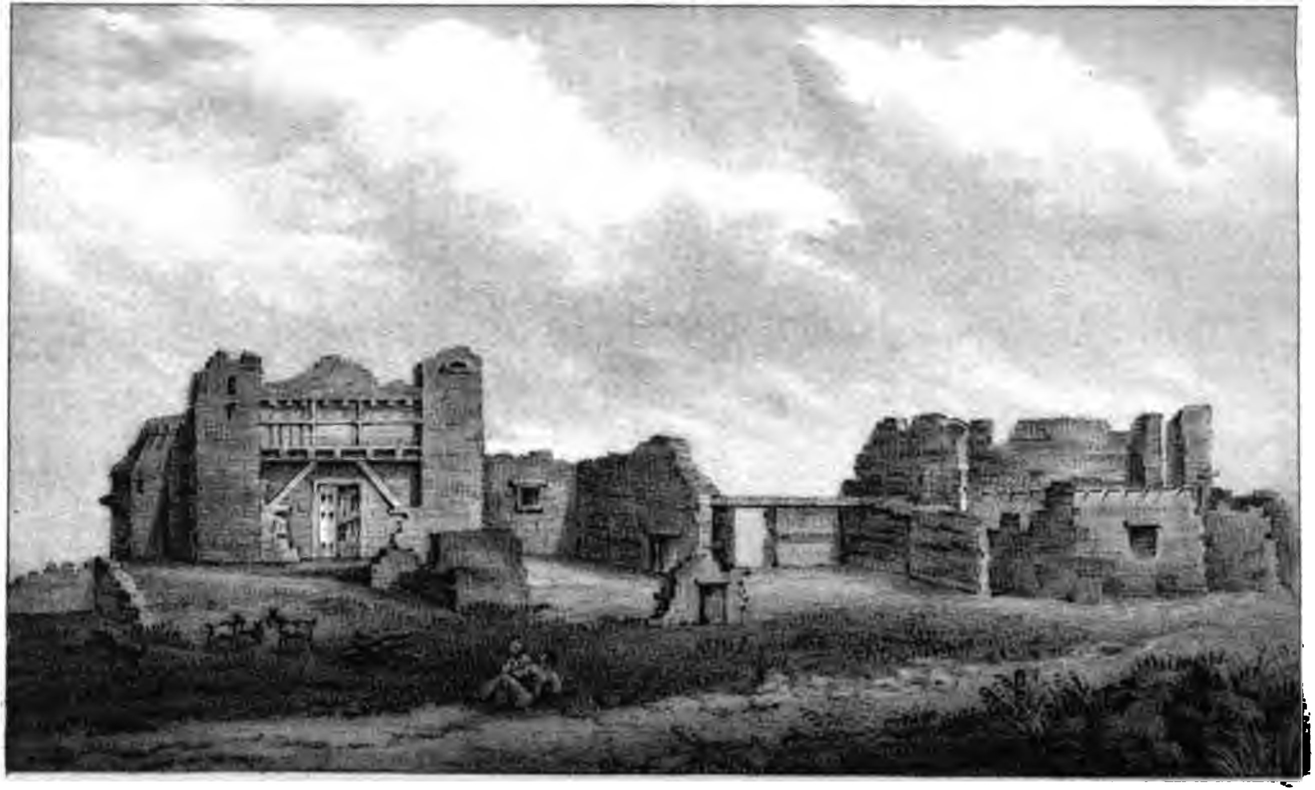
Pecos, once a fortified town, is built on a promontory or rock, somewhat in the shape of a foot. Here burned, until within seven years, the eternal fires of Montezuma, and the remains of the architecture exhibit, in a prominent manner, the engraftment of the Catholic church upon the ancient religion of the country. At one end of the short spur forming the terminus of the promontory, are the remains of the "*estuffa*," with all its parts distinct; at the other are the remains of the Catholic church, both showing the distinctive marks and emblems of the two religions. The fires from the "*estuffa*" burned and sent their incense through the same altars from which was preached the doctrine of Christ. Two religions so utterly different in theory, were here, as in all Mexico, blended in harmonious practice until about a century since, when the town was sacked by a band of Indians.

Amidst the havoc of plunder of the city, the faithful Indian managed to keep his fire burning in the "*estuffa*;" and it was continued till a few years since—the tribe became almost extinct. Their devotions rapidly diminished their numbers, until they became so few as to be unable to keep their immense estuffa (forty feet in diameter) replenished, when they abandoned the place and joined a tribe of the original race over the mountains, about sixty miles south. There, it is said, to this day they keep up their fire, which has never yet been extinguished. The labor, watchfulness, and exposure to heat consequent on this practice of their faith, is fast reducing this remnant of the Montezuma race; and a few years will, in all probability, see the last of this interesting people. The accompanying sketches will give a much more accurate representation of these ruins than any written descriptions. The remains of the modern church, with its crosses, its cells, its dark mysterious corners and niches, differ but little from those of the present day in New Mexico. The architecture of the Indian portion of the ruins present peculiarities worthy of notice.

Both are constructed of the same materials; the walls of sun-dried brick, the rafters of well-hewn timber, which could never have been hewn by the miserable little axes now used by the Mexicans, which resemble, in shape and size, the wedges used by our farmers for splitting rails. The cornices and drops of the architrave in the modern church, are elaborately carved with a knife.

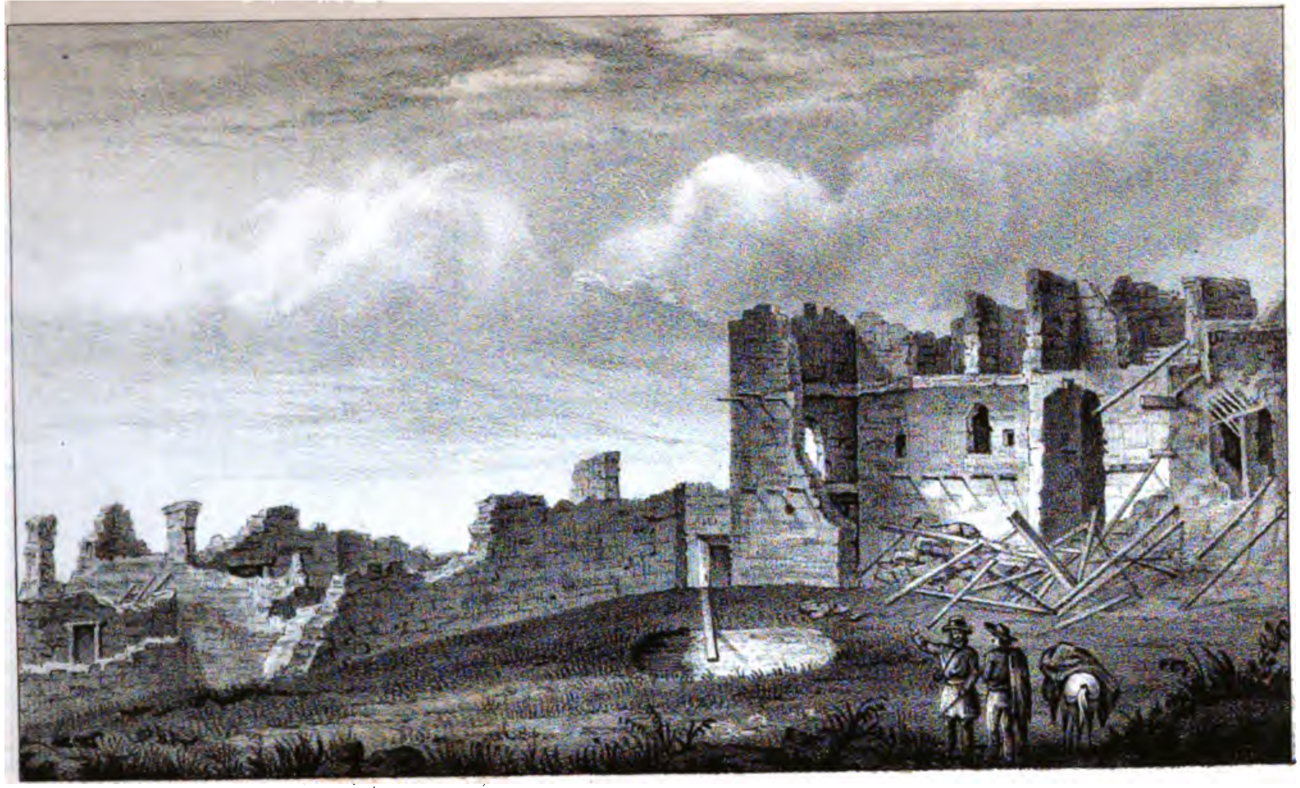
To-night we found excellent grass on the Rio Pecos, abreast of the ruins where the modern village of Pecos is situated, with a very inconsiderable population.

August 18.—We were this morning 29 miles from Santa Fé. Reliable information, from several sources, had reached camp yesterday and the day before, that dissensions had arisen in Armijo's camp, which had dispersed his army, and that he had fled to the south, carrying all his artillery and 100 dragoons with him. Not a hostile rifle or arrow was now between the army and Santa Fé, the capital of New Mexico, and the general determined to make the march in one day, and raise the United States flag over the palace before sundown. New horses or mules were ordered for the artillery, and every thing was braced up for a forced march. The distance was not great, but the road bad, and the horses on their last legs.



RUINS OF PECOS. CATHO. CHURCH.

Lith by E Weber & Co Balto.



RUINS OF PECOS. AZTEK CHURCH

Lith by E Weber & Co Balto.

A small detachment was sent forward at day-break, and at six the army followed. Four or five miles from old Pecos the road leads into a cañon, with hills on each side from 1,000 to 2,000 feet above the road, in all cases within cannon shot, and in many within point blank musket shot; and this continues to a point but 12 or 15 miles from Santa Fé.

The scenery is wild; the geological formation much the same as before described, until you begin to descend towards the Del Norte, when granitic rocks and sands are seen in great abundance on the road as far as Santa Fé. Cedar, piñon, and a large growth of long-leafed pine are densely crowded wherever the rock affords a crevice, until within six or eight miles of the town. Fifteen miles from Santa Fé we reached the position deserted by Armijo. The topographical sketch, by Lieutenant Peck, will give some idea of it. It is a gateway which, in the hands of a skilful engineer and one hundred resolute men, would have been perfectly impregnable.

Had the position been defended with any resolution, the general would have been obliged to turn it by a road which branches to the south, six miles from Pecos, by the way of Galisteo.

Armijo's arrangements for defence were very stupid. His abattis was placed behind the gorge some 100 yards, by which he evidently intended that the gorge should be passed before his fire was opened. This done, and his batteries would have been carried without difficulty.

Before reaching the cañon the noon halt was made in a valley covered with some grama, and the native potato in full bloom. The fruit was not quite as large as a wren's egg. As we approached the town, a few straggling Americans came out, all looking anxiously for the general, who, with his staff, was clad so plainly, that they passed without recognizing us. Another officer and myself were sent down to explore the by-road by which Armijo fled. On our return to the main road, we saw two Mexicans; one the acting secretary of state, in search of the general. They had passed him without knowing him. When we pointed in the direction of the general, they broke into a full run; their hands and feet keeping time to the pace of their nags. We followed in a sharp trot; and, as we thought, at a respectable distance. Our astonishment was great to find, as they wound through the ravine through the open well-grown pine forest, tnat they did not gain on us perceptibly. "Certainly they are in a full run, and as certainly are we only in a trot," we both exclaimed. I thought we were under some optical delusion, and turned to my servant to see the pace at which he was going. "Ah!" said he, "those Mexican horses make a mighty great doing to no purpose." That was a fact; with their large cruel bits, they harass their horses into a a motion which enables them to gallop very long without losing sight of the starting place.

The acting secretary brought a letter from Vigil, the lieutenant governor, informing the general of Armijo's flight, and of his readiness to receive him in Santa Fé, and extend to him the hospitalities of the city. He was quite a youth, and dressed in the fashion of the Americans. Here, all persons from the United States are called Americans, and the name is extended to no other race on the continent. To-day's march was very tedious and vexatious; wishing to enter Santa Fé in an imposing form, frequent halts were made to allow the artillery to come up. Their horses almost gave out, and during the day mule after mule was placed before the guns, until scarcely one of them was spared.

The head of the column arrived in sight of the town about three o'clock; it was six before the rear came up. Vigil and twenty or thirty of the people of the town received us at the palace and asked us to partake of some wine and brandy of domestic manufacture. It was from the Passo del Norte; we were too thirsty to judge of its merits; any thing liquid and cool was palatable. During the repast, and as the sun was setting, the United States flag was hoisted over the palace, and a salute of thirteen guns fired from the artillery planted on the eminence overlooking the town.

The ceremony ended, we were invited to supper at Captain ——'s, a Mexican gentleman, formerly in the army. The supper was served very much after the manner of a French dinner, one dish succeeding another in enless variety. A bottle of good wine from the Paso del Norte, and a loaf of bread was placed at each plate. We had been since five in the morning without eating, and inexhaustible as were the dishes was our appetite.

August 19.—I received an order to make a reconnoissance of the town and select a site for a fort, in co-operation with Lieutenant Gilmer, of the engineers. This occupied me diligently on the 19th and 20th, and on the 21st the general was furnished with the map, a copy of which is sent to the adjutant general and another to the Bureau of Topographical Engineers.

The site selected and marked on the map is within 600 yards of the heart of the town, and is from 60 to 100 feet above it. The contour of the grounds is unfavorable for the trace of a regular work, but being the only point which commands the entire town, and which is itself commanded by no other, we did not hesitate to recommend it. The recommendation was approved. On the 22d we submitted a complete plan of the work, which was also approved. It is computed for a garrison of 280 men.

On the 23d, the work was commenced with a small force; on the 27th, 100 laborers were set to work on it, detailed from the army; and, on the 31st, 20 Mexican masons were added.

As it was determined to send an express to the States on the 25th, I commenced to project and plot my map of the route of the Army of the West, that the government might have at once the benefit of my labors. It was rather a bold undertaking to compress, in a few days, the work of months. My astronomical observations were brought up from day to day as we advanced on the march, without which the undertaking would have been impracticable. We all worked day and night, and, with the assistance of several gentlemen of the volunteers, I succeeded in accomplishing the work; not, however, in a very satisfactory manner.

Events now begin to crowd on each other in quick succession; but my duties keep me so constantly occupied in my office and in the field, that I cannot chronicle them in regular order or enter much upon details. On the morning of the 19th, the general assembled all the people in the plaza and addressed them at some length.

The next day, the chiefs and head men of the Pueblo Indians came to give in their adhesion and express their great satisfaction at our arrival. This large and formidable tribe are amongst the best and most peaceable citizens of New Mexico. They, early after the Spanish conquest, embraced the forms of religion, and the manners and customs of their then more civilized masters, the Spaniards. Their interview was long and interesting. They narrated, what is a tradition with them, that the white man would come from the far east and release them from the bonds and shackles which the Spaniards had imposed, not in the name, but in a worse form than slavery.

They and the numerous half-breeds are our fast friends now and forever. Three hundred years of oppression and injustice have failed to extinguish in this race the recollection that they were once the peaceable and inoffensive masters of the country.

A message was received the same night from Armijo, asking on what terms he would be received; but this proved to be only a ruse on his part to gain time in his flight to the south. Accounts go to show that his force at the Cañon was 4,000 men, tolerably armed, and six pieces of artillery. Had he been possessed of the slightest qualifications for a general, he might have given us infinite trouble. A priest arrived last night, the 29th, and brought the intelligence that at the moment of Armijo's flight, Ugarté, a colonel in the regular service, was on his march, at this side of the Passo del Norte, with 500 men to support him. That, had he continued, he would have been enabled to rouse the whole southern district, which is by far the wealthiest and most populous of the whole country.

In the course of the week, various deputations have come in from Taos, giving in their allegiance and asking protection from the Indians. That portion of the country seems the best disposed towards the United States. A Taos man may be distinguished at once by the cordiality of his salutation.*

A band of Navájoes, naked, thin, and savage looking fellows, dropped in and took up their quarters with Mr. Robideaux, our interpreter, just opposite my quarters. They ate, drank, and slept all the time, noticing nothing but a little cinnamon-colored naked brat that was playing in the court, which they gazed at with the eyes of gastronomes.

Various rumors have reached us from the south that troops are moving on Santa Fe, and that the people are rising, &c. To quiet military possession for the United States. The road from Santa Fé to Fort Leavenworth presents few obstacles for a railway, and, if it continues as good to the Pacific, will be one of the routes to be considered, over which the United States will pass immense quantities of merchandise into what may become, in time, the rich and populous States of Sonora, Durango, and Southern California.

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*Since this was written, the massacre of the excellent Governor Bent has taken place in Taos. It proves the profound duplicity of this race.

As a military position, it is important and necessary. The mountain fastnesses have long been the retreating places of the warlike parties of Indians and robbers, who sally out to intercept our caravans moving over the different lines of travel to the Pacific.

The latitude of Santa Fé, determined by 52 circum-meridian altitudes of alpha aquilæ, 23 of beta aquarii, and 36 altitudes of polaris out of the meridian, is N. 35° 44′ 06″. The longitude, by the measurement of 8 distances between Alpha Aquilæ and the ☽, and 8 between Antares and the ☾, is respectively 7*h*. 04*m*. 14*s*. 7 and 7*h*. 04*m*. 22*s*. 4. The mean of which is 7*h*. 04*m*. 18*s*. and the longitude brought by the chronometer from the meridian of Fort Leavenworth is 7*h*. 04*m*. 05*s*.5—(See Appendix No. 4.)

The place of observation was the court near the northeast corner of the public square. The latitude may be considered fixed; but satisfactory as the longitude may appear, I should, nevertheless, have greatly multiplied the number of lunar distances, had I not been in daily expectation of receiving a transit instrument, with which a set of observations on moon culminating stars could have been made at this important geographical point.

The mean of all the barometric readings at Santa Fé indicates, as the height of this point above the sea, 6,846 feet, and the neighboring peaks to the north are many thousand feet higher.

August 31.—Lieutenant Warner arrived to-day, but cannot yet be relieved from ordnance duty. To-morrow an expedition goes to Taos, but, as Mr. Peck is sick, I have no officer to send with it. To-day apparently well authenticated accounts have arrived that Armijo met Ugarté, about 150 miles below, coming up with a force of 500 regulars and some pieces of artillery; that he turned back, and is now marching towards us with a large force, rallying the people as he passes, and that numbers are joining him from the upper towns. In consequence of these reports, the general has strengthened the force with which he is to march the day after to-morrow to meet him.

September 2.—We marched out of Santa Fé at 9 o'clock, a. m., taking no one of my party except Mr. Bestor, and leaving Lieutenant Peck, who is still an invalid, to assist Lieutenant Gilmer. We descended the valley of the Santa Fé river, nearly west, for five miles, when we left the river and struck across a dry arid plain intersected by arroyos, (dry beds of streams,) in a southwesterly course. Twenty-three miles brought us to the Galisteo creek, which, at that time, was barely running. The bed of the creek is sand and pebbles of the primitive rock, and lies between steep clay and lime-stone, traversed occasionally by trap dykes, which in one place are so regular as to resemble a wall pierced with windows. From this place to its mouth there is scarcely the sign of vegetation. At the dry mouth of the Galisteo, and directly on the Del Norte, is the town of Santo Domingo. Before reaching Galisteo creek, but after leaving Santa Fé some miles, a few sprigs of grama tempted us to halt and bait our nags; but the principal growth on the plains was Ephedra, Diotis lanata, (Romeria of the Spaniards,) hendecandia Texana.

September 3.—This has been a great day. An invitation was received, some days since, from the Pueblo Indians to visit their town of Santo Domingo. From height to height, as we advanced, we saw horsemen disappearing at full speed. As we arrived abreast of the town we were shown by a guide, posted there for the purpose, the road to Santo Domingo. The chief part of the command and the wagon train were sent along the highway; the general with his staff and Captain Burgwyn's squadron of dragoons, wended his way along the bridle path nearly due west to the town. We had not proceeded far, before we met ten or fifteen sachemic looking old Indians, well mounted, and two of them carrying gold-headed canes with tassels, the emblems of office in New Mexico.

Salutations over, we jogged along, and, in the course of conversation, the alcalde, a grave and majestic old Indian, said, as if casually, "We shall meet some Indians presently, mounted, and dressed for war, but they are the young men of my town, friends come to receive you, and I wish you to caution your men not to fire upon them when they ride towards them."

When within a few miles of the town, we saw a cloud of dust rapidly advancing, and soon the air was rent with a terrible yell, resembling the Florida war-whoop. The first object that caught my eye through the column of dust, was a fierce pair of buffalo horns, overlapped with long shaggy hair. As they approached, the sturdy form of a naked Indian revealed itself beneath the horns, with shield and lance, dashing at full speed, on a white horse, which, like his own body, was painted all the colors of the rainbow; and then, one by one, his followers came on, painted to the eyes, their own heads and their horses covered with all the strange equipments that the brute creation could afford in the way of horns, skulls, tails, feathers, and claws.

As they passed us, one rank on each side, they fired a volley under our horses' bellies from the right and from the left. Our well-trained dragoons sat motionless on their horses, which went along without pricking an ear or showing any sign of excitement.

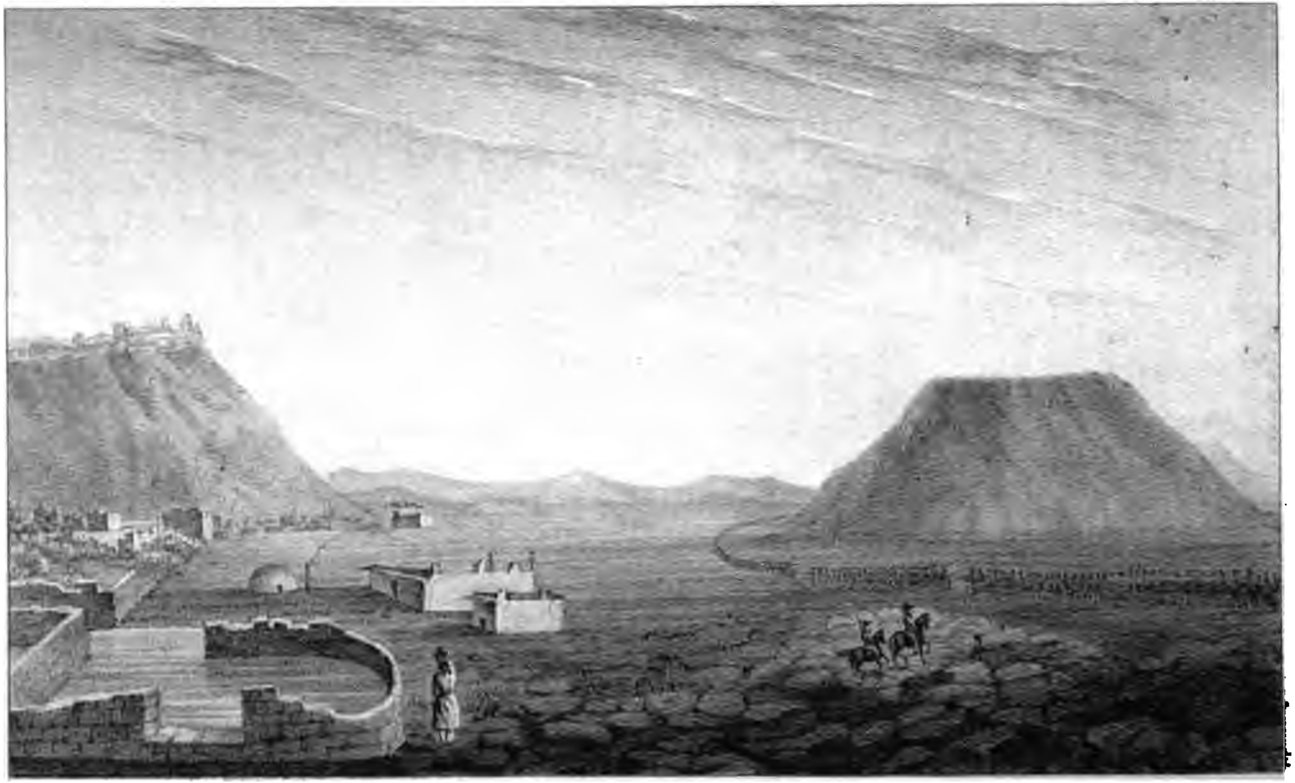
Arrived in the rear, the Indians circled round, dropped into a walk on our flanks until their horses recovered breath, when off they went at full speed, passing to our front, and when there, the opposite files met, and each man selected his adversary and kept up a running fight, with muskets, lances, and bows and arrows. Sometimes a fellow would stoop almost to the earth to shoot under his horses' belly, at full speed, or to shield himself from an impending blow. So they continued to pass and repass us all the way to the steep cliff which overhangs the town. There they filed on each side of the road, which descends through a deep cañon, and halted on the peaks of the cliffs. Their motionless forms projected against the clear blue sky above, formed studies for an artist. In the cañon we were joined by the priest, a fat old white gentleman. We were escorted first to the padre's, of course; for here, as every where, these men are the most intelligent, and the best to do in the world, and when the good people wish to put their best foot foremost, the padre's wines, beds, and couches have to suffer. The entrance to the portal was lined with the women of the village, all dressed alike, and ranged in treble files; they looked fat and stupid.

We were shown into his reverence's parlor, tapestried with curtains stamped with the likenesses of all the Presidents of the United States up to this time. The cushions were of spotless damask, and the couch covered with a white Navajoe blanket worked in richly colored flowers.

The air was redolent with the perfumes of grapes and melons, and every crack of door and windows glistening with the bright eyes and arms of the women of the capilla. The old priest was busily talking in the corner, and little did he know of the game of sighs and signs carried on between the young fellows and the fair inmates of his house. We had our gayest array of young men out to-day, and the women seemed to me to drop their usual subdued look and timid wave of the eyelash for good hearty twinkles and signs of unaffected and cordial welcome—signs supplying the place of conversation, as neither party could speak the language of the other. This little exchange of the artillery of eyes was amusing enough, but I was very glad to see the padre move towards the table, and remove the pure white napkins from the grapes, melons, and wine. We were as thirsty as dust and heat could make us, and we relished the wine highly, whatever its quality. The sponge cake was irreproachable, and would have done honor to our best northern housekeepers. Indeed, wherever we have been feasted, the sponge cake has been in profusion, and of the best kind. After the repast, the general went forward on the portal and delivered a speech to the assembled people of the town, which was first interpreted into Spanish, and then into Pueblo.

It is impossible to arrive at the precise population of the town but I should judge it to be about six hundred, and the quantity of ground under tillage for their support about five hundred acres.

The valley of the Del Norte is here quite narrow, and the soil sandy. The river itself was viewed by me, for the first time, with a strange interest. The hardships, trials, and perseverance of the gallant Pike, and the adventures of the pious and brave soldiers of the cross, Rivèra and La Ford, came forcibly to my mind; as I kneeled down to drink of its waters my thoughts were of them. Leaving Santo Domingo, we struck the highway in about four miles, and two more brought us to the pretty village of San Felippe, overhung by a steep craggy precipice, upon the summit of which are the ruins of a Roman Catholic church, presenting in the landscape sketch the appearance of the pictures we see of the castles on the Rhine.



SAN FELIPPE—NEW MEXICO

Lith. by E. Weber & Co. Balto.

Between San Felippe and the Angosturas, six miles below, the valley of the river is very narrow, affording no interval for agriculture. On the west side, the banks are steep walls, crowned by seams of basalt forming the table lands. The east is composed of rolling sand hills, rising gradually to the base of the mountains, and covered with large round pebbles. I must except from this the poverty-stricken little town of Algodones, which has some ground round it in cultivation.

The observations for the determination of this camp, about one mile below the town of San Felippe, were made on my return, (September 10th,) and will be found under that date in Appendix No. 5. The height indicated by the barometer of this, the first camp on the Rio del Norte, is 5,000 feet above the level of the sea.

September 4.—Below the Angosturas, the valley of the river opens into a plain, varying from two to six miles in width, generally sufficiently low and level to admit the water of the river to be carried over it for the purposes of irrigation; but the soil is very sandy and better adapted to Indian corn than wheat. Of this last we saw but few stubbles, the ground being chiefly planted with corn. The vegetation is much the same as that described after leaving Santa Fé, with the addition of quite a number of compositæ.

News now began to arrive which left but little doubt that the reports which caused our movement down the river were exaggerated, if not wholly without foundation. People had passed down the river, as was reported, but in no great numbers. A messenger came in from the alcalde of Tomé with an official note, stating that Armijo had left with him one hundred mules, pressed into service to meet us at the cañon, and that Armijo had also notified him that one hundred more would be left at the Paso del Norte. These belonged to citizens of New Mexico, and had been taken from them without their consent. It was his practice, in peace or in war, to seize the person or property of any who fell under his displeasure.

The town of Bernalhilo is small, but one of the best built in the territory. We were here invited to the house of a wealthy man, to take some refreshment. We were led into an oblong room, furnished like that of every Mexican in comfortable circumstances. A banquette runs around the room, leaving only a space for the couch. It is covered with cushions, carpets, and pillows; upon which the visiter sits or reclines. The dirt floor is usually covered a third or a half with common looking carpet. On the uncovered part is the table, freighted with grapes, sponge-cake, and the wine of the country. The walls are hung with miserable pictures of the saints, crosses innumerable, and Yankee mirrors without number. These last are suspended entirely out of reach; and if one wishes to shave or adjust his toilet, he must do so without the aid of a mirror, be there ever so many in the chamber.

We passed on to the house of our host's wealthy son, where we were invited to dine. Here we found another refreshment table;

and, after waiting some hours, dinner was announced. It was a queer jumble of refinement and barbarism; the first predominating in every thing, except in the mode of serving, which was chiefly performed by the master, his Mexican guests, and a few female serfs.

The plates, forks, and spoons were of solid New Mexican silver, clumsily worked in the country. The middle of the table was strewed with the finest white bread, cut in pieces and within the reach of every cover. At close intervals were glass decanters, of Pittsburg manufacture, filled with wine made on the plantation. The dishes were served separately. The first was soup maigre; then followed roast chicken, stuffed with onions; then mutton, boiled with onions; then followed various other dishes, all dressed with the everlasting onion; and the whole terminated by chilé the glory of New Mexico, and the frijolé.

Chilé the Mexicans consider the chef-d'œuvre of the cuisine, and seem really to revel in it; but the first mouthful brought the tears trickling down my cheeks, very much to the amusement of the spectators with their leather-lined throats. It was red pepper, stuffed with minced meat.

From Bernallilo the valley opens, but narrows again at Zandia, an Indian town on a sand-bank at the base of a high mountain of the same name, said to contain the precious metals.

They were treading wheat here, which is done by making a circular "corral" on a level ground of clay; upon this floor they scatter the wheat, turn in a dozen or more mules, and one or two Indians, who, with whoops, yells, and blows, keep the affrighted brutes constantly in motion. To separate the wheat from the chaff, both Indians and Mexicans use a simple hand-barrow, with a bottom of raw bull's hide perforated with holes. I should suppose it must take an hour to winnow a bushel.

After dining sumptuously at Sandival's we went to our camp in the Alameda. Here the valley is wide and well cultivated. The people of the surrounding country flocked in with grapes, melons, and eggs. Swarms of wild geese and sand cranes passed over camp. They frequent the river and are undisturbed save when some American levels his rifle.

By observation, the lattitude of this camp is 35° 11′ 50″, and the longitude 106° 45′ 00″ west of Grenwich.

September 6.—We encamped last night on very indifferent grass. Breakfasted with Don José Chavez, at Perdilla. When sitting our chins just reached the table. There were five or six courses, ending with coffee. Before breakfast, we were summoned to mass in Don José's private chapel, where the eccentric person we met at yesterday's dinner officiated. Priest, fop, courtier, and poet were curiously combined in one person. Proud of his pure white hand, he flourished it incessantly, sometimes running his fingers through his hair in imitation of some pretty coquette, and ever and anon glancing in one of the many looking-glasses with which the church was decorated. After mass, to our surprise, he delivered an eloquent discourse, eulogising the grandeur, magnanimity, power, and justice of the United States.

Attending mass before breakfast proved anything but an appetizer. The church was crowded with women of all conditions, and the horrid reboso, which the poor use for shawls, bonnets, handkerchief, and spit box, sent out an odor which the incense from the altar failed to stifle.

One fact struck me as singular in all the houses that we visited, the ladies never made their appearance; and it was always by the merest accident that we caught a glimpse of one of the family.

At Isoletta, I became tired of the show, and, seeing my servant talking at the door of one of his acquaintances, I took the liberty of asking permission to take a quiet siesta; but this was out of the question. The good woman overwhelmed me with a thousand questions about the United States, which could only be stopped by questioning her in return. She denounced Armijo; said, with a true Castilian flash of the eye, "I do not see how any man wearing those things," pointing to my shoulder straps, "could run away as he did. He had a good army to back him, and could have driven you all back."

The valley suddenly contracts below Perdilla, between Isoletta and Peralta. On the east side of the river there is deep sand, and the country is perfectly barren.

I observed to-night, for time and latitude at my camp, about 500 feet northwest of Senora Chavez private chapel; thirteen altitudes of Polaris give for the latitude of this place, 34° 50′ 57″; and twelve of Corona Borealis, and nine of Alpha Pegasi, give the chronometric longitude *7h. 07m. 8s.4.*

September 7.—The early part of last evening was most beautifully bright and serene; the air was of the most delightful temperature, varied occasionally by a gentle breeze from the south, wafting along the perfume of the vineyards. I made some observations for time and latitude; the last unsatisfactorily, owing to the brightness of the moon dimming the southern stars. About 11 o'clock, the whole character of the night was changed by an east wind that came rustling down from the mountains, driving the sand before it. Nearly the whole distance travelled in the last three days has been over drifting sand, with only occasional patches of firm soil.

After rising early to attend to some business, I walked over the town of Peralta, which is interspersed with cotton-wood, growing in nearly the regular order of an apple orchard. I then repaired to head-quarters, at the palace of Mr. Ortera, a spacious one story edifice, five hundred feet front.

We marched and encamped near Tomé. It was the eve of the fête of Tomé in honor of the Virgin Mary, and people from all parts of the country were flocking in crowds to the town. The primitive wagons of the country were used by the women as coaches. These wagons were heavy boxes mounted on wheels cut from large cotton-wood; over the top of the box was spread a blanket, and inside were huddled, in a dense crowd, the women, children, pigs, lambs, and "everything that is his." The man of the family usually seated himself on the tongue of the wagon, his time divided between belabouring his beasts and scratching his head. In one of these wagons a violin was being played, and the women who were sitting on their feet, made the most of the music by brandishing their bare arms and moving their heads to the cadence. At night there was a theatrical representation in the public square. The piece dramatized was from the Old Testament.

During the day I had been puzzled by seeing at regular intervals on the wall surrounding the capilla, and on the turrets of the capilla itself, (which be it remembered is of mud,) piles of dry wood. The mystery was now to be cleared up. At a given signal all were lighted, and simultaneously a flight of rockets took place from every door and window of the chapel, fire-works of all kinds, from the blazing rocket to children's whirligigs, were now displayed in succession. The pyrotechny was the handicraft of the priests. I must say the whole affair did honor to the church, and displayed considerable chemical knowledge. Most of the spectators were on mules, each with his woman in front, and it was considered a great feat to explode a rocket under a mule's belly without previous intimation to the rider.

September 8.—Long shall I remember the fête of Tomé, a scene at once so novel and so striking. To-day, my duties called me off early in the morning.

I had to examine guides in reference to the route to California, and engage such as I might think fit for the trip.

My last interview of this kind to-day was in a species of public building, or guard-house, where a number of Mexicans had collected with arms. Several written tablets hung round the walls, but they were perfectly illegible. Our business was cut short by the sound of passing music. A strange sight presented itself. In a sedan chair, borne by four men, was seated a wax figure nearly as large as life, extravagantly dressed; following immediately were three or four priests, with long tallow candles, a full yard in length. Some American officers followed, each holding a candle. Unfortunately I emerged just as this group was passing; there was no escape, and the moment I joined, a grave Mexican (apparently a man in authority) thrust a candle into my hand. I thought of my coat, my only coat, the coat which was on my back, and which must take me to California, and back again into the interior of Mexico! Suddenly there was a halt without any word of command, and in the confusion we jostled each other and distributed the tallow in great profusion.

It was thought proper that the officers should show every respect to the religious observances of the country, consequently they did not decline participation in these ceremonies.

The procession ended at the church. After the services there were concluded we repaired to the house of the padre, where we found a collation.

We had proposed attending a theatrical representation going on in the open air, but a heavy squall of wind and a few drops of rain put a stop to this amusement, and all retired to dress for the fandango, which is the name given to all collections of people where there is music and dancing.

A cotillion was attempted in honor of the Americans present, but this cold and formal dance soon gave way to the more joyous dances of the country, the Coona, the Bolero, and the Italiana. Every variety of figure was introduced, but the waltz was the basis of all except the Bolero, which, as danced here resembles our negro jig.

At the dance we found a very plain, but very intelligent woman, the sister of Armijo, who said he would return as soon as he settled his affairs in Chihuahua.

September 11.—Returned to Santa Fé.

September 15—Sent Lieutenant Warner, with a party consisting of Lieutenant Peck and three men to determine the latitude of Taos and the topography of the road.

From the 15th to 25th September I was busily engaged in fitting out for California.

Lieutenant Abert, who was left dangerously ill at Bent's Fort, had not arrived on the 25th, but accounts reached me that he was convalescent, and on his way to Santa Fé, where he might shortly be expected. Lieutenant Peck was also an invalid, and neither being able to accompany us to California, I left, by the general's direction, the subjoined order for them to make a map of New Mexico, based upon the astronomical points and measurements determined by myself, and to furnish from the best statistical sources, an account of the population and resources, military and civil, of the province.

SANTA FE, *September* 14, 1846.

SIR: I am charged by the general commanding to inform you that you will remain for the present in the territory of New Mexico, and should your health, or that of Lieutenant Peck, be sufficiently restored to return to duty, that you will continue the survey of this territory, commenced by myself, and follow it to completion, provided it does not interfere with other military duties which may be required of you by the officer left in command of the territory.

With the limited number of instruments that can be placed in your hands, it is not expected that you will conduct the survey on strict geodetic principles, yet it is believed that sufficient precision can be attained to answer all the requirements of the military and civil service.

The country from Taos to Fra Cristobal contains nearly all the ground that is under cultivation, and nearly all that is worth cultivating; and for this whole distance it is open and bounded by high and conspicuous peaks, affording great facilities for conducting your operations.

I have established the astronomical position of six points in this territory, viz: camp 42, at Vegas; camp 43, Vernal springs, Santa

Fé; camp 55, 1¼ miles south of the church of San Felippe; camp 49, at the Alameda; camp 51, at Peralta, at the mill, and I shall establish two more, one at Taos, and the other at Socoro.

These points are quite sufficient, and will be the base of your operations; and upon them you will form a trigonometric canevas. For this purpose the rule requiring every angle of the series to be greater than 30°, may be wholly disregarded. And after having determined by triangulation the position of any three conspicuous peaks, the position of any other points, which are in view of the three first named, may be determined by the problem of three points, as is practised in hydrographic surveys. Many such points will present themselves.

The *canevas* completed, the course of the Del Norte, that of its tributaries to the base of the mountains or beyond the settlements; the width of the valleys; the quantity of land under cultivation; the position of the towns, churches, hills, and all other topographical features of the country, can be determined with the Schmalkalder compasses.

If your force is sufficient, the operation described in this last paragraph may be carried on simultaneously with the triangulation. You are aware that I have no theodolite at my disposal; the triangulation must, therefore, be made with the sextant.

The population, number of cattle, horses, and sheep, and the quantity of grain and other agricultural products, the facilities and best localities for water power to propel machinery, and also the mineral resources of the country, it is very desirable to know. You will, therefore, give particular attention to acquiring all the information on these subjects which the present statistical knowledge in the country will afford.

A requisition for five thousand dollars will be made on the Bureau of Topographical Engineers, for the survey, to be placed to your credit with Mr. Robert Campbell of St. Louis, upon whom, I should think, you might safely draw without waiting to hear from Washington.

I made a requisition on the bureau, dated June 18, 1846, for a transit instrument, and also for an instrument to obtain the magnetic dip and declination. Should these arrive, you will unpack them, mount the instruments near the place where I observed in Santa Fé, and commence a series of observations for longitude by moon culminating stars, and for the magnetic dip and declination.

The series for longitude will be continued for at least three lunations, and, should an opportunity present itself, I wish the observations and results to be communicated to me in California.

I am, very respectfully your obedient servant,

W. H. EMORY,
First Lieut. Corps Top. Engineers.

Lieutenant J. W. Abert, or in his absence,
Lieutenant W. G. Peck.

General orders were issued designating the force to march on California. It consisted of three hundred United States 1st dragoons, under Major Sumner, who were to be followed by the battalion of Mormons, five hundred in number, commanded by Captain Cooke.

Colonel Doniphan's regiment was to remain in New Mexico until relieved by Colonel Price's regiment, which was daily expected to reach there from the United States, when Colonel Doniphan's regiment was directed to effect a junction with General Wool at Chihuahua.

Major Clarke's two batteries of artillery were divided—one company, Captain Fisher's, to be left in New Mexico; the other, Captain Weightman's, to accompany Colonel Doniphan. The battalion of foot, under Captain Agney, was directed to remain in Santa Fé.

Thus was the army of the west divided into three columns, to operate in regions remote from each other, and never to unite again in one body.

September 25.—I received notice that the general was to march at 2, p. m., for California. His force consisted of three hundred dragoons, to be followed by a battalion of Mormons on foot that had not yet arrived in Santa Fé.

My requisition for twelve pack-saddles and eight mules not being filled, I determined to delay starting for an hour or two, and did not reach my camp, sixteen miles distant, till long after dark. I found my tent pitched, my supper smoking, and corn secured for my mules; this was gratifying, and I congratulated myself on the reorganization of my party, at least so far as the *personel* was concerned, for I had never found my camp so well attended to.

The day was excessively hot, the night very cold, the thermometer 32 degrees.

Memorandum.—My party is now organized as follows:

Lieutenant Warner, topographical engineers, &c.
J. M. Stanly, draughtsman.
Norman Bestor, assistant.

Men.

James Early, driver to instrument wagon;
W. H. Peterson, in charge of horizon box and cantina for sextants;
Baptiste Perrot, driver of transportation wagon;
Maurice Longdeau, in charge of spare mules;
François de Von Cœur, in charge of spare mules;
Frank Ménard, assistant teamster;
James Riley, assistant to Bestor;
Dabney Eustis, assistant to Stanly,
and the private servants of Lieutenant Warner and myself.

Our road is over the ground heretofore travelled and chronicled as far as Tomé.

As an evidence of the ignorance of the people here respecting the topography of the country, and also the ignorance of foreigners who have lived fifteen or twenty years in Santa Fé, no one could tell me where the Rio Santa Fé debouched into the Rio Grande.

I may here remark, that every night I furnished the distances travelled over to General Kearny at headquarters, and very often (whenever required) the latitude of the camp. In many cases these and the distances have been published; I shall, therefore, not repeat them. The latitudes in some cases have been incorrectly reported, and in others recomputed, and are therefore now given as final results.

September 26, 27, 28, 29, and 30.—We marched over the same ground already travelled over and described, between the 2d and 7th of September.

Below Zandia we were attracted by a great noise. It proceeded from a neighboring rancheria, where we saw eight or ten naked fellows hammering away in a trough full of cornstalks, as I had never seen Mexicans exert themselves before. The perspiration from their bodies was rolling off into the trough in profusion, and mingling with the crushed cane. This was then taken out, boiled, and transferred to a press, as primitive in construction as any thing from the hands of Father Abraham.

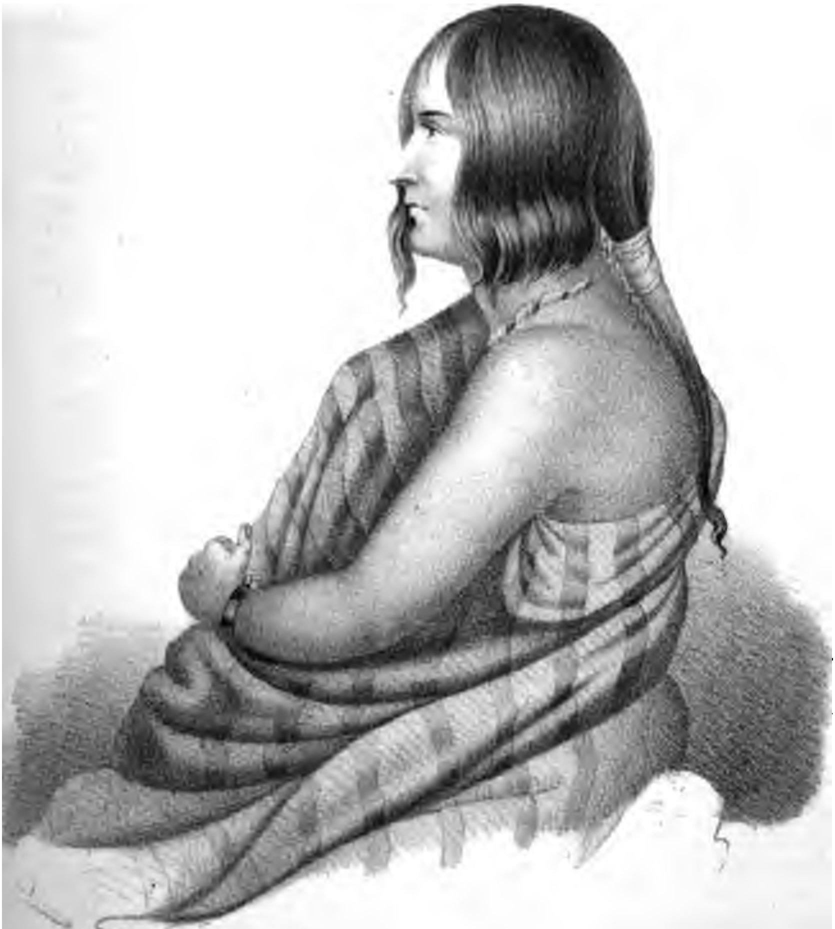
The hopper was the trunk of a scooped cotton-wood tree, into this was inserted a billet of wood, upon which the leaver rested about midway. Men, women, and children were mounted on each end; all see-sawing in the highest glee. I suggested, as an improvement, that one end of the lever be confined, and the whole of the living weight be transferred to the other end. "No! No!" said the head man, "if I do that, the fun of see-sawing will be over, and I can't get any body to work." The man was a disciple of Charles Fourier, and desired "to make labor attractive."

The morning of the 29th opened with a grand trade in mules and horses. A few days' experience was quite enough to warn us that our outfit would not answer, and the general directed that all the poor mules and horses should be exchanged for fat ones. The scene reminded one more of a horse market than a regular camp. The more liberal were our offers for the animals, the more exorbitant became the demands of the Mexicans.

At Albuquerque I was directed to call and see Madame Armijo, and ask her for the map of New Mexico, belonging to her husband, which she had in her possession. I found her ladyship sitting on an ottoman smoking, after the fashion of her country-women, within reach of a small silver vase filled with coal. She said she had searched for the map without success; if not in Santa Fé, her husband must have taken it with him to Chihuahua.

We crossed the Rio Grande del Norte at Albuquerque, its width was about twenty-five yards, and its deepest part just up to the hubs of the wheels. It is low at present, but at no time, we learned, is its rise excessive—scarcely exceeding one or two feet.

We encamped a little more than half way between Albuquerque and Pardillas, on a sandy plain, destitute of wood, and with little grass.



A NEW MEXICAN INDIAN WOMAN

Lith by E Weber & Co Balto

We saw myriads of sand crane, geese, and brant.

September 30.—Feeling no desire to go over the same ground twice, I struck off on the table lands to the west, and found them a succession of rolling sand hills, with Obione canescens, Franseria acanthocarpa, yerba del sapa of the Mexicans, and occasionally, at very long intervals with scrub cedar, about as high as the boot-top.

I saw here the hiding places of the Navajoes, who, when few in numbers, wait for the night to descend upon the valley and carry off the fruit, sheep, women, and children of the Mexicans. When in numbers, they come in day-time and levy their dues. Their retreats and caverns are at a distance to the west, in high and inaccessible mountains, where troops of the United States will find great difficulty in overtaking and subduing them, but where the Mexicans have never thought of penetrating. The Navajoes may be termed the lords of New Mexico. Few in number, disdaining the cultivation of the soil, and even the rearing of cattle, they draw all their supplies from the valley of the Del Norte.

As we marched down the river to meet Ugartó and Armijo, the Navajoes attacked the settlements three miles in our rear, killed one man, crippled another, and carried off a large supply of sheep and cattle. To-day we have a report, which appears well authenticated, that the Mexicans taking courage at the expectations of protection from the United States, had the temerity to resist a levy, and the consequence was, the loss of six men killed and two wounded.

They are prudent in their depredations, never taking so much from one man as to ruin him. Armijo never permitted the inhabitants to war upon these thieves. The power he had of letting these people loose on the New Mexicans was the great secret of his arbitary sway over a people who hated and despised him. Any offender against Armijo was pretty sure to have a visit from the Navajoes.

I stopped at the little town of Isoletta, to visit my friend, the alcalde, who has the reputation, Indian though he be, of being the most honest man and best maker of brandy in the territory. Mr. Stanly accompanied me, for the purpose of sketching one of the women as a specimen of the race. I told the alcalde our object, and soon a very beautiful woman made her appearance, perfectly conscious of the purpose for which her presence was desired. Her first position was exquisitely graceful, but the light did not suit, and when Stanly changed her position, the charm of her attitude was gone.

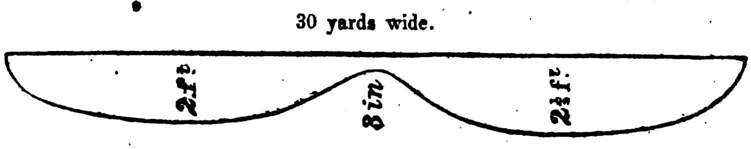
We came down from the table lands through a ravine, where the lava, in a seam of about six feet, overlaid soft sand-stone. At the point of junction, the sand was but slightly colored. The lava was cellular, and the holes so large that the hawks were building nests in them.

At this ravine the Navajoes descended when they made their last attack; at the same moment the volunteers were ascending the other slope of the hill, on their way to garrison Cibolletta.

The camp of this date (September 30) is near the camp of September 6; and my observations this evening verified, in a very satisfactory manner, the travelling rate assumed for the chronometer 783. The longitude of camp of September 7, given by chronometer, is *7h.* 07*m.* 00*s.*; that of this present camp, which is one mile west of it, is 7*h.* 07*m.* 08*s.* Here, in addition to my usual observations for time and latitude, I took a set of lunar distances, with east and west stars.—(See Appendix.)

Above this camp, there is on the river a considerable growth of cotton-wood; among which are found some "signs" of beaver. The plains and river bottoms were covered with much the same growth as that heretofore noted; to which may be added an Erythera, a handsome little gentian-like plant, with deep rose-colored flowers, and a Solanum, a kind of wild potato, with narrow leaves, which Dr. Torrey says is different from any in the United States.

October 1.—To-day, for the first time for six days, I was able to rise from my bed without assistance. The air was elastic, and fragrant with the perfumes of the wild sage from the adjacent hills. Everything was, in truth, couleur de rose; for the sun beamed out bright and red, infusing the same tint over the landscape, till near meridian. I crossed to Tomé, in search of some non-complying guides. We recrossed at Tomé, and measured the section of the river. Accordingly, we found the Rio Grande del Norte, many hundred miles from its source,



This section is about the same as at San Felippe and Santo Domingo. If to it we add the section of a stream of water carried off by two large zequias, each nine feet by two, we shall have an estimate of the volume of water discharged by this famous river, for 150 miles, through the most populous and fertile part of its valley.

Below Tomé, for a few miles, the valley widens, the soil improves, and the cultivation is superior to any other part, particularly that of the rancherias around the pleasant little village of Belen.

October 2.—This morning we passed the pretty church in the village of Sabinal, after which the settlements became very few and far between. We encamped opposite La Lloya, at the bend of the river Del Norte, where the low sand hills on either side seem to unite and shut up the valley.

We received a message from the major domo of the neighboring rancheria, cautioning us to be watchful of our animals, that forty of the Navajoes had passed the river last night. The incursions of these Indians have prevented the settlement and cultivation of this part of the country.

VALENCIA NEW MEXICO

Lith by E. Weber & Co. Balt.

The sand bank, at the foot of which we are encamped, is filled with serpentine, harder than that which is dug in such quantities from the site of Fort Marcy, near Santa Fé.

Now and then we came to spots from which the waters were prevented from escaping by the sand, and had evaporated, leaving saline incrustations; about these we found growing abundantly Atriplex and Salicornia.

October 3.—The wagons from the rear not being up, we laid by all day, in hourly expectation of their arrival and an order to march. An express from Colonel Price came up, informing us of his arrival in Santa Fé.

About 12 o'clock in the day, a Mexican came into camp, with his horse foaming, to say that the Navajoes had made an attack on the town of Pulvidera. One company of dragoons were immediately despatched to the place, about twelve miles distant.

This camp was one of the prettiest of the whole march, on the curve of the river, fringed with large cotton-woods growing at intervals. The air was mild and balsamic, the moon shone brightly, and all was as still as death, except when a flock of geese or sand-cranes were disturbed in their repose. Several large cat-fish and soft-shell turtle were caught, and we saw blue-winged ducks, plovers, doves, and a few meadow larks.

No fact proves the indolence and incapacity of the Mexican for sport or for war more glaringly, than that these immense flights of sand-cranes and geese are found quietly feeding within gunshot distance of their houses and largest towns. Going into Albuquerque, I started a hungry-looking wolf in a water melon patch, close under the walls of the town.

October 4.—The wagons mounted the sand hills with great difficulty. The river impinges so close on the hills as to make it necessary, on the western side, to mount the table lands. These plains, reaching to the base of the mountains, are of the same character as heretofore mentioned, of rolling sand hills, covered with Obione-canescens, Prosopis glandulosa, (romeria,) Riddellia tagetina, Paga-paga, and a few patches of grama. This last is the only nutriment the plains afford for horses and cattle; but mules and asses, when hard pressed, will eat the trato and romeria. The Chamisa grows to a considerable height, and the stalk is sometimes two or three inches in diameter; a fire can be made of it sufficient to boil a kettle or roast an egg. To-day I eat, for the first time, the fruit of the prickly pear, the "yerba de la vivera," of the Mexicans; as I was thirsty, it tasted truly delicious, having the flavor of a lemon with crushed sugar.

Below La Joya two sand hill spurs, overlaid with fragments of lava and trap, project from the east and west, closing the valley, just leaving sufficient space for the river to pass between. The river winds below in a beautiful semicircle, bending to the west. On either side is excellent grass, apparently untouched, and shaded by large cotton-woods. To the west, the hills of Pulvidera form an amphitheatre. The whole picture, the loveliest I have seen in

New Mexico, loses nothing by being projected, from where we stood, against the red walls of the Sierra Grande, which extend from Zandia southward, dividing the waters of the Puerco, of the east, from those of the Rio Grande.

I longed to cross these mountains and explore the haunts of the Apaches, and the hiding place of the Camanches, and look up a nearer route home by the way of the Red river, which the hunters and voyageurs all believe to exist. But onward for California was the word, and he who deviated from the trail of the army must expect a long journey for his jaded beast and several days' separation from his baggage. We were not on an exploring expedition; war was the object; yet we had now marched one thousand miles without fleshing a sabre.

Arrived at the town of Pulvidera, which we found, as its name implies, covered with dust, we received full accounts of the attack made on the town by the Apaches the day before. The dragoons arrived too late to render assistance.

About one hundred Indians, well mounted, charged upon the town and drove off all the horses and cattle of the place. The terrified inhabitants fled to their mud houses, which they barricaded. The people of Lamitas, a town two miles below, came to the rescue, and seized upon the pass between the Sierra Pulvidera and the Sierra Socoro. The Indians seeing their retreat with the cattle and goats cut off, fell to work like savages as they were, killing as many of these as they could, and scampered off over the mountains and cliffs with the horses and mules, which they could more easily secure.

This same band entered the settlements some miles above when we were marching on Santa Fé, and when Armijo had called all the men of the country to its defence. In this foray, besides horses, they carried off fifteen or sixteen of the prettiest women.

Women, when captured, are taken as wives by those who capture them, but they are treated by the Indian wives of the capturers as slaves, and made to carry wood and water; if they chance to be pretty, or receive too much attention from their lords and masters, they are, in the absence of the latter, unmercifully beaten and otherwise maltreated. The most unfortunate thing which can befal a captive woman is to be claimed by two persons. In this case, she is either shot or delivered up for indiscriminate violence.

These banditti will not long revel in scenes of plunder and violence. Yesterday Colonel Doniphan's regiment was directed to march into their country and destroy it. One of their principal settlements, and farming establishments, is said to be nearly due west from here, about two days' march; the road leading through the formidable pass above noted.

Yesterday and to-day we came across some unoccupied strips of ground. Their number yesterday was greater than to-day; for, since we passed Pulvidera, the sand hills encroach on the river and leave the valley scarcely a mile wide. The cotton-wood, however, is getting more plentiful, and we have not been obliged to use the bois de vache in cooking for some days.

To-night I measured two sets, or 18 lunar distances, east and west ☾, 12 altitudes of polaris, 10 of andromedæ, and 8 of alpha Lyræ. The resulting latitude 34° 07′ 39″.

Longitude 7*h* 07*m*. 54*s*.

October 5.—*Camp near Socoro.*—Last night a Mexican came into camp, and said we should now leave the river and strike for the Gila, nearly due west. He was one of the men engaged by me as guide while on the first trip to Tomé. We accordingly moved only six miles to-day, and encamped a little north of Socoro, preparatory to taking the hills to-morrow. The prospect is forbidding; from the Sierra Lescadron, opposite the amphitheatre, as far south as the eye can reach on the western side of the river, is a chain of precipitous basaltic mountains, traversed by dykes of trap. Through these we are to pass.

I rode to the base of the Sierra Socoro, overhanging the town of that name, and about three miles distant from the river. It is a confused mass of volcanic rocks, traversed by walls of a reddish colored basalt and seams of porphyritic lava and metamorphic sandstone. In one or two places, where the water had washed away the soil near the base, I found specimens of galena and copper ore, very pure; but of the extent of these beds I can form no opinion, nor can I say positively they were not erratic. The ore in this mountain is said, at one time, to have been worked for gold; but the difficulty of getting quicksilver induced the operator to move to a mine on the opposite side of the river, near Manzanas, where, it is said, quicksilver is to be found; but the specimens from that place, of what the inhabitants exhibited as rock containing quicksilver, on analysis, was found to contain none. Should the command halt to-morrow to prepare for the mountains, I shall be enabled to give the place a more thorough examination.

To the east, close to the banks of the river, still runs the Sierra Grande, which commences at Zandia with such towering heights, but here tapers down to moderate sized hills. The formation is apparently of different colored sandstone, and wherever the stratification shows itself, dipping about 25 degrees to the south and east; but in some places it is horizontal, and in others showing great disturbance. With the glass may be seen walls of light colored stone, basalt or trap, running off for miles in a straight line, nearly north and south. The town of Socoro, containing about one hundred inhabitants, is prettily situated in the valley of the river, which is here almost circular, and about three or five miles in diameter. The church, as usual, forms the salient point, which meets the eye at a great distance.

The growth on the sand plains to-day was chiefly iodeodonda[*] and a little stunted acacia. The iodeodonda is a new plant, very

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[*] Since writing the above, the following extract of a note from Doctor Torrey was received in reference to this plant, which is so remarkable, and extends over so great a surface.

"The *iodeodonda* I find described in a late work by Moricand, entitled '*Plantes nouvelles ou rares d'Amerique!*" It is described by him as a new genus, under the name Larrea. It is well figured in his 43th plate as *Larrea Mexicana*. In its affinities it is allied to *guiacum*."

One or two large white cedars were seen to-day, and, in addition to the usual plants, was that rare one cevallia sinuata, and a species of wild liquorice, but with a root not sweet, like the European kind.

The latitude of this camp by 10 altitudes of Polaris, 33° 41′ 19″. And the longitude, from 18 observations, of east and west stars, 7*h*. 08*m*. 57*s*.

October 8.—*Camp* 69.—The valley of the Del Norte, as we advance, loses what little capacity for agriculture it possessed. The river commences to gather its feeble force into the smallest compass to work its way around the western base of Fra C istobal mountain. The Chihuahua road runs on the eastern side, and that part of it is the dreaded jornado of the traders, where they must go, most seasons of the year, ninety miles without water.

Our road over hill and dale led us through a great variety of vegetation, all totally different from that of the United States. To-day's observations of the plants may be taken as a fair specimen of the southern part of New Mexico. First, there were cacti in endless variety and of gigantic size, the disagreeable Larrea Mexicana, Obine canescens, Tessaria borealis, Diotis lanata, Franseria acanthocarpa, several varieties of mezquite, and among the plants peculiar to the ground passed over, were several compositæ, a species of Malva convolvulus, an unknown shrub found in the beds of all deserted rivers; larger grama, as food for horses, nearly equal to oats, and Dalea formosa, a much branched shrub, three feet high, with beautiful purple flowers. The infinite variety of cacti could not be brought home for analysis, and this department of the Flora must be left to the enterprise of some traveller, with greater means of transportation than we possessed. A great many were sketched, but not, it is feared, with sufficient precision to classify them.

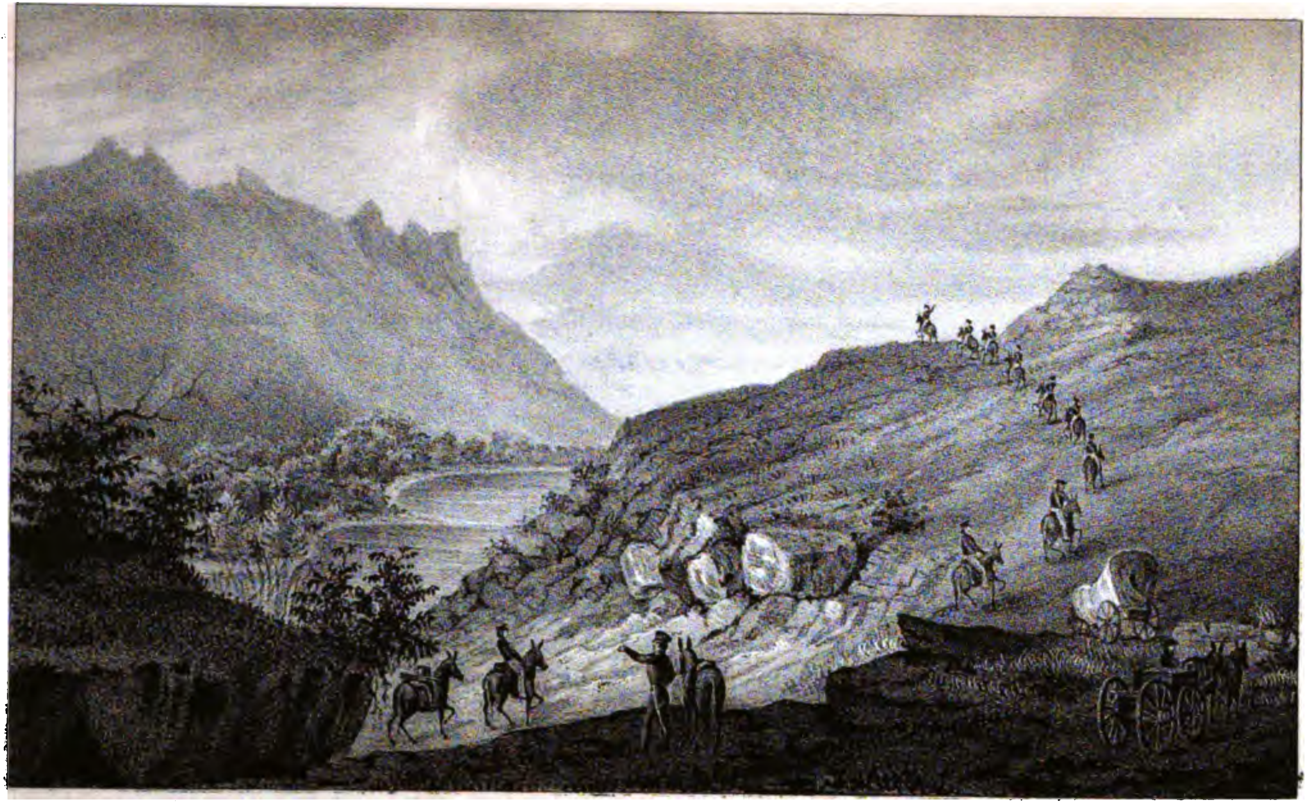
The table lands, reaching to the base of the mountains to the west, are of sand and large round pebbles, terminating in steep hills from a quarter to a half mile from the river, capped with seams of basalt. Some curious specimen of soft sandstone were seen to-day, of all shapes and forms, from a batch of rolls to a boned turkey.

October 9.—The country becomes broken, and the valley narrows into a cañon which sweeps at the base of Fra Cristobal mountain, making it necessary to rise to the table lands on the west side, which we found travered by deep arroyos, crowned on their summits by basalt, underlayed by sandstone.

I shot two or three quails, (*ortix squamosa?*) differing from ours in their plumage, but entirely similar to them in their habits. We also killed a hawk resembling, in all respects, our sparrow-hawk, except in the plumage, which like the quail, was that of the landscape, lead colored.

Game in New Mexico is almost extinct, if it ever existed to any extent. To-day we saw a few black tailed rabbits, and last night Stanly killed a common Virginia deer.

Three distinct ranges of mountains, on the west side of the river, are in view to-day, running apparently northwest, and nearly par-



THE LAST DAY WITH THE WAGONS

Lith by E Weber & Co Balto

allel to each other. The lesser range commences at Socoro; the next at Fra Cristobal mountain, and the last at a point farther west, yet to be determined. The ravines between are broad, and show the beds of dry streams, which would probably be found watered when near their sources. A butte was seen in the distance, close to the river, and surrounded by trees, which was at first taken for an adobe house, but the near approach showed it a conglomerate cemented by lime, which had been left standing when the surrounding earths were washed away. At its base I found some rare specimens of olivine set in lava. The road was unbroken, obstructed by bushes, and so bad that the wagons made only 11½ miles, and the teams came into camp "*blown*" and staggering after their day's work. Expecting nothing better ahead, it was determined to leave the wagons and send back for pack-saddles. My own pack-saddles having been brought along, I had time to observe the rates of my chronometers and make other preparations necessary for so important a change in our mode of proceeding.

October 10th, 11th, and 12th were passed in camp waiting for the pack-saddles.

We are now 203 miles from Santa Fé, measured along the river; 16 circum-meridian altitudes of beta Aquarii, and 17 altitudes of Polaris give me for the latitude of the place 33° 20′ 02″, and the longitude, by the chronometer, 7*h.* 08*m.* 57*s.* We must soon leave the river. A cross section of it at this point is 118 feet wide, with a mean depth of 14 inches, flowing over large round pebbles, making it unsuitable for navigation with any kind of boats.

The height of our first camp on the Del Norte, one mile north of San Felippe, indicated by the barometer, was 5,000 feet, showing we had descended, from Santa Fé, 1,800 feet.

Here the height is 4,241 feet, showing an average fall in the Del Norte, from the camp near San Felippe to this place, of four feet and a half per mile. The greater part of the way the fall is uniform and unobstructed by rapids, and the river flows, for the most part, over a bed of sand, without any sensible increase or diminution in its volume of water. Sometimes its tranquil course is rippled by large angular fragments of basalt, trap, lava, and amygdaloid, which everywhere strew the table lands of New Mexico.

Our present camp is in a valley 70 or 100 acres in extent, well grassed and wooded, and apparently untrodden by the foot of man; for here we saw, for the first time in New Mexico, any considerable "signs" of game in the tracks of the bear, the deer, and the beaver. We flushed several bevies of the blue quail, saw a flock of wild geese, summer duck, the avocet, and crows.

Above and below us is a cañon, and on the eastern side of the river the Fra Cristobal shoots up to a great height. We saw on its sides, reaching nearly to the top, large black objects which we could not distinguish with our indifferent glasses, but which must be either shrubbery or rocks.

For the last night or two it has been unusually cold, the thermometer ranging from 25° to 32° Farenheit, but during the day it mounts up to 75° and 80°.

October 13.—Moved one mile to get better grass. Just as we had pitched our new camp Lieutenant Ingalls came up with a mail, and gave the pleasant information that the saddles were only about six hours behind.

October 14.—We parted with our wagons, which were sent back under charge of Lieutenant Ingalls, and, in doing so, every man seemed to be greatly relieved. With me it was far otherwise. My chronometers and barometer, which before rode so safely, were now in constant danger. The trip of a mule might destroy the whole. The chronometers, too, were of the largest size, unsuited to carry time on foot or horseback. All my endeavors, in the 24 hours allowed me in Washington to procure a pocket chronometer, had failed. I saw then, what I now feel, the superiority of pocket over large chronometers for expeditions on foot or horseback. The viameter for measuring distances, heretofore attached to the wheel of the instrument wagon, was now attached to the wheel of one of the small mounted howitzers.

The valley narrows into a cañon at Bush peak, and opens again a mile or so wide, where we encamped for the night. The growth of to-day is much the same as yesterday.

Rush peak is, on its river face, a steep escarpment of basalt, and abreast of it, on the west side of the river, we saw many chips of metalliferous limestone. To-day, met a solitary Mexican mounted on a mule, driving before him a horse, with his back literally skinned with the saddle. He was beating the poor beast over the galled place. The Mexicans generally treat their horses and mules in a barbarous manner, riding and packing them when their backs are running with sores.

October 15.—After travelling three and a half miles, we turned off from the Del Norte and took final leave of it at a pretty little grove, where we found two Mexicans returning from a trading expedition to the Apaches. They were attending a poor worn out jennet, (that had been maltreated and overtasked,) in the hope that a few days' rest would enable it to take their lazy bodies to the settlements.

At this point, several intelligent guides were detached to look up a road further south, by which Captain Cooke, who is to follow us with the Mormons, may turn the mountains with his wagons.*

After mounting to the table land, some 200 feet above the valley, it is very level, except where the table land is indented by the streams from the mountains, most of which are now dry. We passed two in succession, both deep and wide enough to contain all the water of the Mississippi, and presenting the appearance of the deserted beds of once large and turbulent rivers. The beds were paved with large round pebbles, mostly of the red fieldspathic granite.

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* The route followed by Colonel Cooke will be found traced on the map.

On the table land the winter grama (a more delicate grass than summer grama) was in great abundance, but now dry and sun burnt.

Far off to the south, between the peaks of two high mountains, stretched the table land contiguous to the valley of the Del Norte. For the first time since leaving the Arkansas the mirage was seen, and gave the wide opening the appearance of a sheet of water disturbed by the wind. Two distant peaks looming up looked, for all the world, like a fore-and-aft-schooner. As I was observing this my mule came to a halt at the edge of a steep precipice. Below were green trees and luxuriant foliage, the sure indication of water. The stream was clear, limpid, and cool, the first, but one, I had seen since crossing the Alleghanies, where water could be drunk without imbibing a due proportion of mud and sand.

In the valley grows cotton-wood, a new variety of evergreen oak, with leaves like the holly, a new variety of ash, and a new kind of black walnut, with fruit about half the size of ours. The oak was covered with round red balls, the size and color of apricots—the effects of disease or the sting of an insect.

Four miles further brought us to another creek of clear water, running sluggishly, and like the last the size of a man's waist. In its valley were many large trees, uprooted, presenting the appearance of newly cleared ground.

On the plains and in the dry valleys were many rare specimens of chalcedony. The only living thing seen was a small rattlesnake, the first since we left Vegas, of the size and mark of the small prairie snake, but of reddish hue, like that of the ground it inhabited.

Observed to-night for latitude and longitude; our height was (approximately) 4,810 feet above the sea.

October 16.—We commenced the approach to the Mimbres mountains over a beautiful rolling country, traversed by small streams of pure water, fringed with a stunted growth of walnut, live oak and ash. The soil in the valleys and to the hill tops of the best quality, covered with a luxuriant growth of grama, Chondrosium fœnum differing from the large grama. Nothing but rain is required to make this part of the country inhabitable. There were several new and beautiful varieties of cactus, and the Diotis lanata grew in great luxuriance; one a miniature tree, with the stalk six inches in diameter.

This must one day become a great grazing country, particularly for sheep. The pure dry air is eminently adapted to them, and they are said to be in all New Mexico very prolific, an ewe seldom failing to drop two lambs.

October 17.—We ascended from the stream, on which we were encamped, by a narrow valley for 2½ hours before reaching the summit between it and the Mimbres, which was so indistinct that I passed it several miles before discovering it. We descended in an arroyo towards the Rio Mimbres, very narrow, and full of shattered pitch stone; the sides and bank covered with a thick growth of stunted live oak. In full view, nearly the whole time of our descent, was a mountain of peculiar symmetry, resembling the segment of a spheroid. I named it "the Dome." Our road led along its base to the north; another path leading to Janos, a frontier town in Sonora, passes down the Mimbres on the south side. The Mimbres was traversed only a mile; for that distance its valley was truly beautiful, about one mile wide, of rich fertile soil, densely covered with cotton-wood, walnut, ash, &c. It is a rapid, dashing stream, about fifteen feet wide and three deep, affording sufficient water to irrigate its beautiful valley. It is filled with trout. At this place we found numberless Indian lodges, which had the appearance of not having been occupied for some time. We turned westward and ascended all the way to our camp.

The mountains appeared to be formed chiefly of a reddish amygdaloid and a brown altered sandstone, with chalcedonic coating. In places, immense piles of conglomerate protruded; disposed in regular strata, dipping to the south at an angle of 45°. There was also one pile of volcanic glass brittle, in strata about half an inch thick, dipping 45° to the south. The character of the country and its growth to day are very similar to those of yesterday; several new plants and shrubs, amongst which was the cercoçarpus parvifolius, a curious rosaceous shrub, "with a spiral, feathery tail, projecting from each calyx when the plant is in seed." The spiral tailed or barbed seed-vessels fall when ripe, and, impelled by the wind, work into the ground by a gyratory motion. The cedar seen to-day was also very peculiar; in leaf resembling the common cedar of the States, but the body like the pine, except that its bark was much rougher. (For the rest of the day's growth, see catalogue of plants for this date.)

At night, 12 circum-meridian altitudes of beta Aquarii, and seven altitudes of Polaris, give for the latitude of the camp 42° 11′.

October 18.—A succession of hills and valleys covered with cedar, live oak and some long-leafed pine. We passed at the foot of a formidable bluff of trap, running northwest and southeast, which I named Ben Moore, after my personal friend, the gallant Captain Moore, of the 1st dragoons. In many places the path was strewed with huge fragments of this hard rock, making it difficult for the mules to get along. Turning the north end of Ben Moore bluff, we began to drop into the valley of what is supposed an arm of the Mimbres, where there are some deserted copper mines. They are said to be very rich, both in copper and gold, and the specimens obtained sustain this assertion. We learned that those who worked them made their fortunes; but the Apaches did not like their proximity, and one day turned out and destroyed the mining town, driving off the inhabitants. There are the remains of some twenty or thirty adobe houses, and ten or fifteen shafts sinking into the earth. The entire surface of the hill into which they are sunk is covered with iron pyrites and the red oxide of copper.

Many veins of native copper were found, but the principal ore is the sulphuret. One or two specimens of silver ore were also obtained.

Mr. McKnight, one of the earliest adventurers in New Mexico,

VALLEY OF THE MIMBRES

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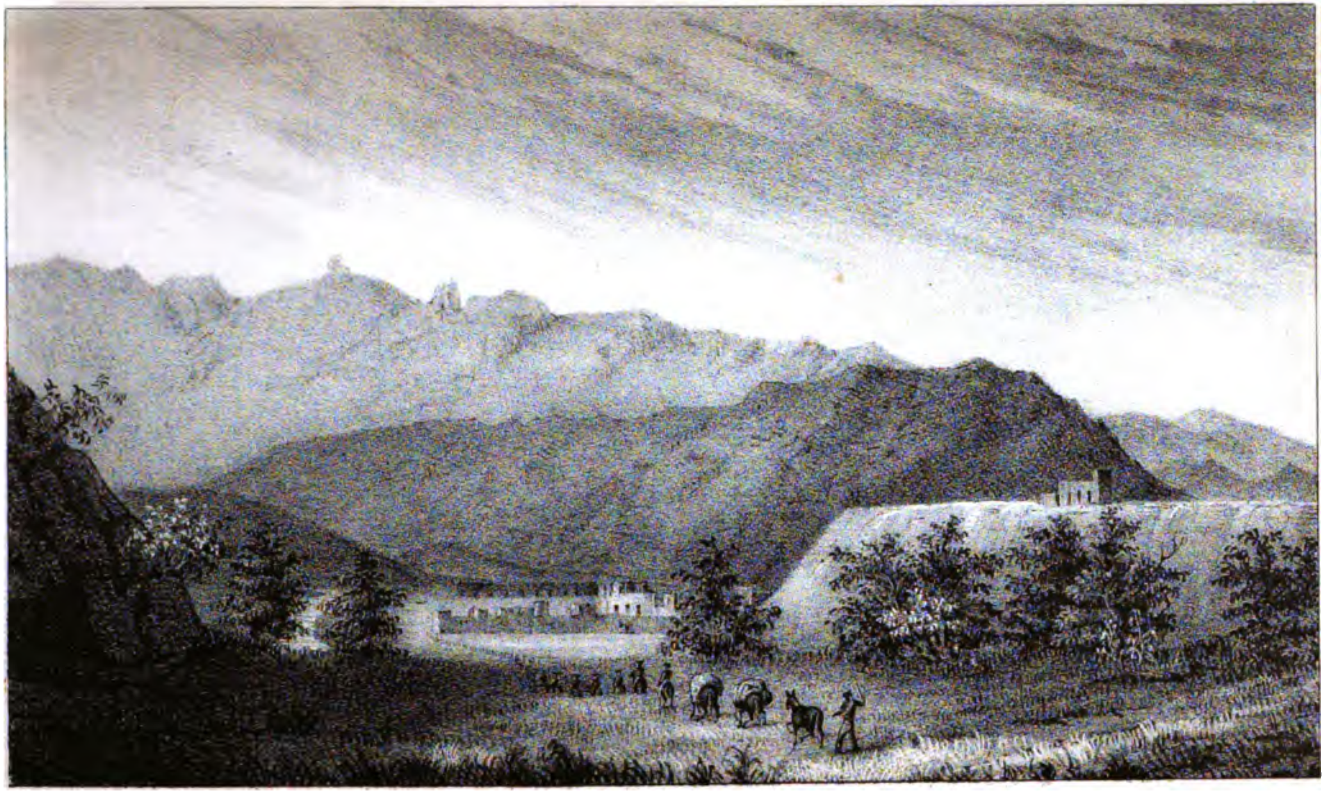


VIEW OF THE COPPER MINE

Lith. by E. Weber & Co Balto.

was the principal operator in these mines, and is said to have amassed an immense fortune. On his first arrival in the country he was suspected to be an agent of the United States, and thrown into prison in Sonora, where he was kept in irons for eleven years. He is said to have stated that the gold found in the ore of these mines paid all the expenses of mining, and the transportation of the ore to the city of Mexico, where it was reduced.

We were disappointed in not meeting the Apaches yesterday and to-day. This afternoon three men came in dressed very much like the Mexicans, mounted on horses. They held a talk, but I do not know the purport. This afternoon I found the famous mezcal, (an agave,) about three feet in diameter, broad leaves, armed with teeth like a shark; the leaves arranged in concentric circles, and terminating in the middle of the plant in a perfect cone. Of this the Apaches made molasses, and cook it with horse meat.

We also found to-day the Dasylirion graminifolium, a plant with a long, narrow leaf, with sharp teeth on the margin, with a stalk eighteen feet high. According to Doctor Torrey, it has lately been "described by Zuccarini," who says "four species of this genus are now known, all of them Mexican or Texan."

The elevation of this camp was 6,167 feet.

October 19.—I tried last night to get observations for latitude, &c., but the early part was cloudy, and we fell asleep and did not wake till broad daylight. In the afternoon there was a thunder-storm to the west, which swept around towards the north, where it thundered and lightened till nearly 9 o'clock. The country passed over in the first part of to-day was beautiful in the extreme; a sucession of high, rolling hills, with mountains in the distance. The soil rich, and waving with grama. The latter part was more barren, and covered with artemisias.

The spring of San Lucia, 13½ miles from the copper mines, very large, and impregnated with sulphur, is in a beautiful valley, surrounded, at the distance of ten or fifteen miles, with high mountains. This was the place appointed for meeting the Apaches, at 11, a. m.; but arriving at 12, and not finding them as we expected, and the grass all eaten up, we moved on to Night creek, making 30 miles. We halted at night on unknown ground, by the side of a creek, so miry that the mules, some of which had not drunk since morning, refused to approach it. It was dark; many of the men mistook the trail and got on the wrong side of the treacherous creek. The mules began to bray for water, and the men to call out for their messmates; all were in confusion. My thoughts of last night came vividly to my mind, as I heard the voice of my chronometer man on the other side, asking to be shown the way across. I sent him word to retrace his steps two or three miles.

The assembly call was sounded, which seemed to settle all things; and, as far as the clouds would allow me, I obtained observations. This is only the second time since leaving the 100th degree of longitude that I have been interrupted by clouds in my observations. Nothing has been heretofore more rare than to see the heavens overcast.

An Apache has just come in, and says the people who agreed to meet us at the spring yesterday are coming on with some mules to trade.

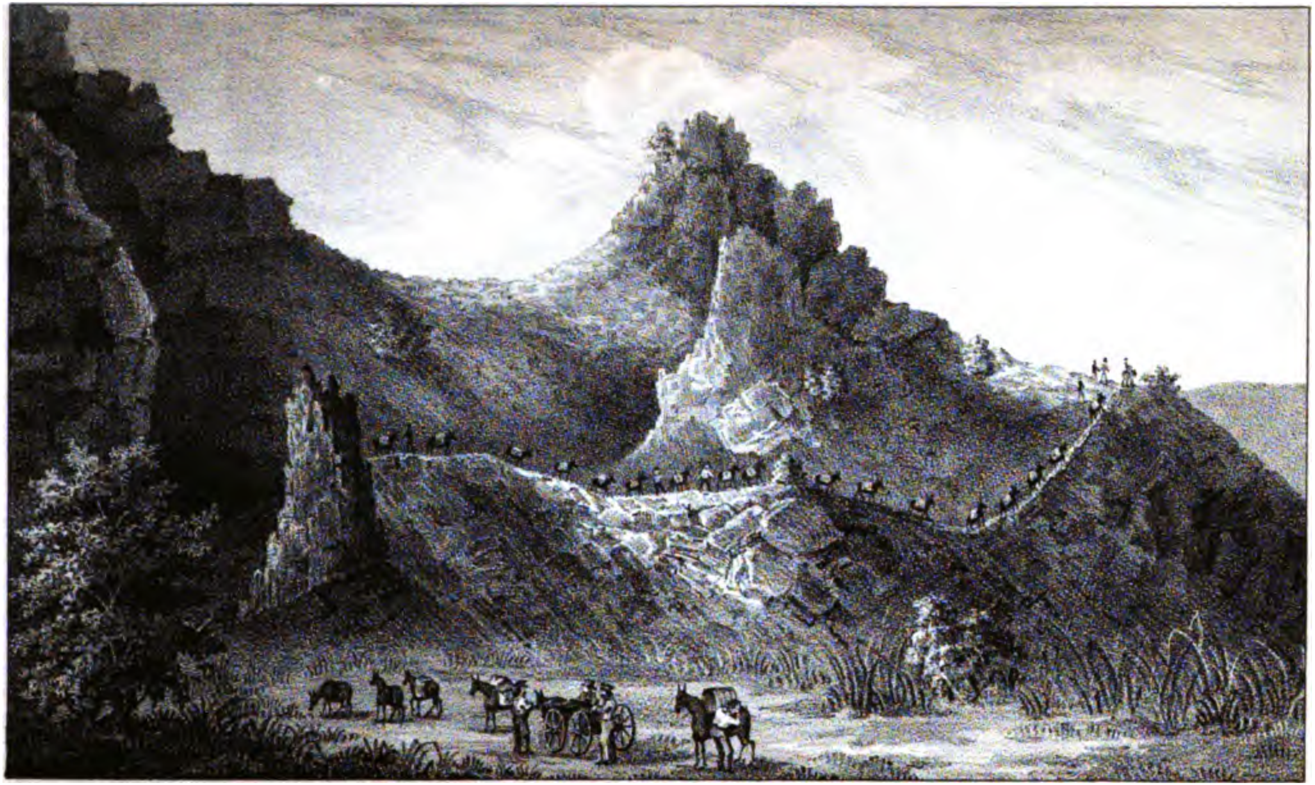
Three miles from the camp of last night we had reached the "divide," and from that point the descent was regular and continuous to Night creek. The ravines on either side of the "divide" are covered with fragments of blue limestone and rich specimens of the magnetic oxides of iron.

October 20.—My curiosity was excited to see by daylight how my camp was disposed and what sort of place we were in. It was quite certain the broad, level valley we had been travelling the last few miles was narrowing rapidly, by the intrusion of high precipices; and the proximity of great mountains in confused masses indicated some remarkable change in the face of the country. We were, in truth, but a few miles from the Gila, which I was no less desirous of seeing than the Del Norte.

The general sent word to the Apaches he would not start till 9 or 10. This gave them time to come in, headed by their chief, Red Sleeve. They swore eternal friendship to the whites, and everlasting hatred to the Mexicans. The Indians said that one, two or three white men might now pass in safety through their country; that if they were hungry, they would feed them; or, if on foot, mount them. The road was open to the American now and forever. Carson, with a twinkle of his keen hazel eye, observed to me, "I would not trust one of them."

The whole camp was now busily engaged in attempting to trade. The Indians had mules, ropes, whips and mezcal. We wished to get a refit in all save the mezcal, offering to give in exchange red shirts, blankets, knives, needles, thread, handkerchiefs, &c. &c.; but these people had such extravagant notions of our wealth, it was impossible to make any progress. At length the call of "boots and saddles" sounded. The order, quickness and quietude of our movements seemed to impress them. One of the chiefs, after eyeing the general with apparent great admiration, broke out in a vehement manner: "You have taken New Mexico, and will soon take California; go, then, and take Chihuahua, Durango, and Sonora. We will help you. You fight for land; we care nothing for land; we fight for the laws of Montezuma and for food. The Mexicans are rascals; we hate and will kill them all." There burst out the smothered fire of three hundred years! Finding we were more indifferent than they supposed to trade, and that the column was in motion, they became at once eager for traffic.

They had seen some trumpery about my camp which pleased them, and many of them collected there. My packs were made. One of my gentlest mules at that moment took fright, and went off like a rocket on the back trail, scattering to the right and left all who opposed him. A large, elegant looking woman, mounted a straddle, more valiant than the rest, faced the brute and charged upon him at full speed. This turned his course back to the camp; and I rewarded her by half a dozen biscuit, and through her intervention, succeeded in trading two broken down mules for two



MOUTH OF NIGHT GREEK

Lith by E. Weber & Co Balt.

good ones, giving two yards of scarlet cloth in the bargain. By this time a large number of Indians had collected about us, all differently dressed, and some in the most fantastical style. The Mexican dress and saddles predominated, showing where they had chiefly made up their wardrobe. One had a jacket made of a Henry Clay flag, which aroused unpleasant sensations, for the acquisition, no doubt, cost one of our countrymen his life. Several wore beautiful helmets, decked with black feathers, which, with the short shirt, waist belt, bare legs and buskins, gave them the look of pictures of antique Grecian warriors. Most were furnished with the Mexican cartridge box, which consists of a strap round the waist, with cylinders inserted for the cartridges.

These men have no fixed homes. Their houses are of twigs, made easily, and deserted with indifference. They hover around the beautiful hills that overhang the Del Norte between the 31st and 32d parallels of latitude, and look down upon the States of Chihuahua and Sonora; and woe to the luckless company that ventures out unguarded by a strong force. Their hills are covered with luxuriant grama, which enables them to keep their horses in fine order, so that they can always pursue with rapidity, and retreat with safety. The light and graceful manner in which they mounted and dismounted, always upon the right side, was the admiration of all. The children are on horseback from infancy. There was amongst them a poor deformed woman, with legs and arms no longer than an infant's. I could not learn her history, but she had a melancholy cast of countenance. She was well mounted, and the gallant manner in which some of the plumed Apaches waited on her, for she was perfectly helpless when dismounted, made it hard for me to believe the tales of blood and vice told of these people. She asked for water, and one or two were at her side; one handed it to her in a tin wash basin, which, from its size, was the favorite drinking cup.

We wended our way through the narrow valley of Night creek. On each side were huge stone buttes shooting up into the skies.

At one place we were compelled to mount one of these spurs almost perpendicular. This gave us an opportunity of seeing what a mule could do. My conclusion was, from what I saw, that they could climb nearly as steep a wall as a cat. A pack slipped from a mule, and, though not shaped favorably for the purpose, rolled entirely to the base of the hill, over which the mules had climbed.

A good road was subsequently found turning the spur and following the creek, until it debouched into the Gila, which was only a mile distant.

Some hundred yards before reaching this river the roar of its waters made us understand that we were to see something different from the Del Norte. Its section, where we struck it, (see the map,) 4,347 feet above the sea, was 50 feet wide, and an average of two feet deep. Clear and swift, it came bouncing from the great mountains which appeared to the north about sixty miles distant. We crossed the river, its large round pebbles and swift current causing the mules to tread warily.

We followed its course, and encamped under a high range of symmetrically formed hills overhanging the river. Our camp resembled very much the centre of a yard of huge stacks.

We heard the fish playing in the water, and soon those who were disengaged were after them. At first it was supposed they were the mountain trout, but, being comparatively fresh from the hills of Maine, I soon saw the difference. The shape, general appearance, and the color, are the same; at a little distance, you will imagine the fish covered with delicate scales, but, on closer examination, you will find that they are only the impression of scales. The meat is soft, something between the trout and the catfish, but more like the latter. They are in great abundance.

We saw here also, in great numbers, the blue quail. The bottom of the river is narrow, covered with large round pebbles. The growth of trees and weeds was very luxuriant; the trees chiefly cotton-wood, a new sycamore, mezquite, pala, (the tallow tree of our hunters,) a few cedars, and one or two larch. There were some grape and hop vines.

16 circum-meridian observations of beta Aquarii, and 9 of Polaris, give the latitude of this camp 32° 50′ 08″. Its approximate longitude is 108° 45′ 00″.

October 21.—After going a few miles, crossing and recrossing the river a dozen times, it was necessary to leave its bed to avoid a cañon. This led us over a very broken country, traversed by huge dykes of trap and walls of basalt. The ground was literally covered with the angular fragments of these hard rocks.

From one of these peaks we had an extended view of the country in all directions. The mountains run from northwest to southeast, and rise abruptly from the plains in long narrow ridges, resembling trap dykes on a great scale. These chains seem to terminate at a certain distance to the south, leaving a level road, from the Del Norte about the 32d parallel of latitude, westward to the Gila. These observations, though not conclusive, agree with the reports of the guides, who say Colonel Cooke will have no difficulty with his wagons.

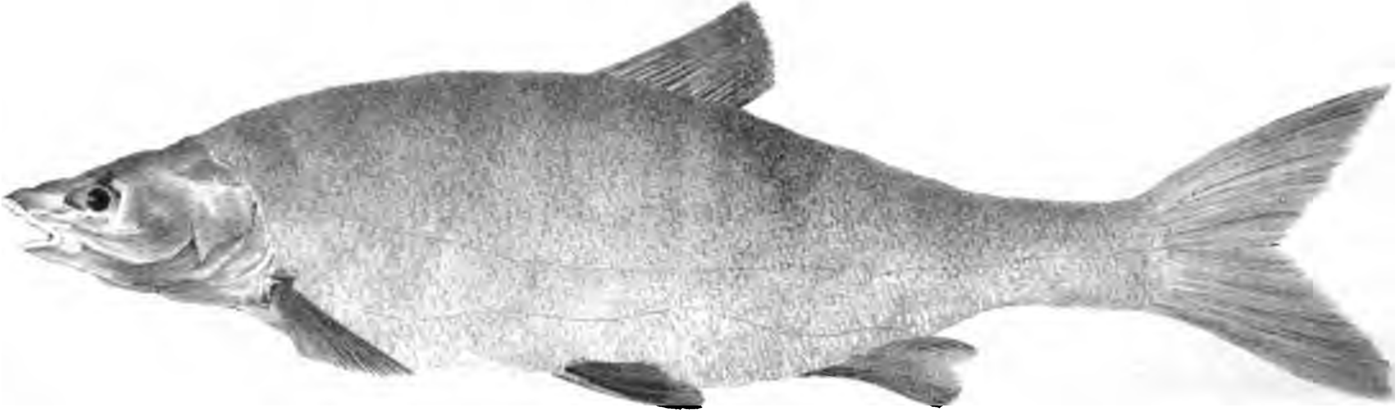
The mountains were of volcanic rock of various colors, feldspathic granite, and red sandstone, with a dip to the northwest, huge hills of a conglomerate of angular and rounded fragments of quartz, basalt, and trap, cemented by a substance that agrees well with the description I have read of the puzzolana of Rome.

The earth in the river bed, where it was not paved with the fragments of rocks, was loose, resembling volcanic dust, making it unsafe to ride out of the beaten track. A mule would sometimes sink to his knee; but the soil was easily packed, and three or four mules in advance made a good firm trail.

This was a hard day on the animals, the steep ascents and descents shifting the packs, and cutting them dreadfully.

The howitzers did not reach camp at all.

A few pounds of powder would blast the projections of rock from the cañon, and make it passable for packs, and possibly for wagons also. The route upon which the wagons are to follow is,



FISH OF THE RIO GILA WITHOUT SCALES

Lith. by E. Weber & Co. Balto.

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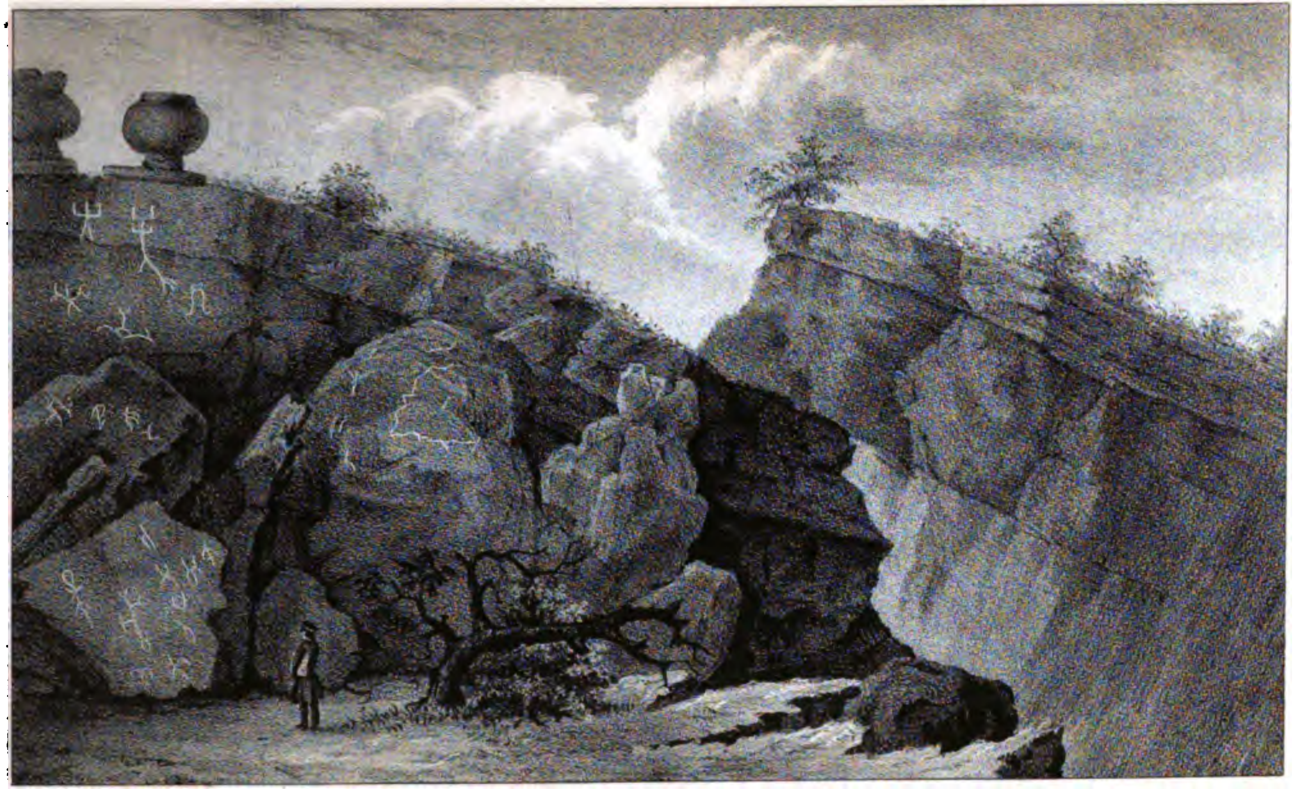


HIEROGLIPHICS

Lith. by E. Weber & Co. Balto

however, to the south of this. Under this date, in the catalogue of plants, will be found many differing from those heretofore observed; amongst them, a new shrub, with an edible nut, and many varieties of mezquite.

October 22 —The howitzers came up about 9 o'clock, having, in the previous day's work, their shafts broken, and, indeed, everything that was possible to break about them. We again left the river to avoid a cañon, which I examined in several places, and saw no obstacles to a good road. The cañon was formed by a seam of basalt, overlaying limestone and sandstone in regular strata. Through these the river cuts its way.

Many deep arroyos have paid tribute to the Gila, but in none have we yet found water. Following the bed of one of these, to examine the eccentric geological formation it displayed, I found unknown characters written on a rock, copies of which were made, but their antiquity is questionable.

We were now fast approaching the ground where rumor and the maps of the day place the ruins of the so-called Aztec towns. This gave the characters alluded to additional interest; they were indented on a calcareous sandstone rock, chrome-colored on the outside, presenting a perfectly white fracture. This made them very conspicuous, and easily seen from a distance. The coloring matter of the external face of the rock may proceed from water, as there was above the characters a distinct water line, and every appearance that this gorge had more than once been the scene of overflows and devastation.

We encamped on a bluff, high above the river, in view of a rock which we named, from its general appearance, Steeple rock.

Latitude of our camp to-night, by 17 circum-meridian altitudes of Beta Aquarii, 32° 38′ 13″. Longitude 109° 07′ 30″.

October 23.—Last night the heavens became overcast, the air damp, and we expected, for the first time since leaving Santa Fé, (a month to-morrow,) to have a sprinkle of rain; but, at 9 this morning, the clouds had all been chased away, and the sun careered up in undisputed possession of all above the horizon. The atmosphere resumed its dryness and elasticity, and at night the stars looked brighter, and the depth of the spaces between greater than ever.

The changes of temperature are very great, owing to the distance from the influence of large masses of water, and, if they were accompanied by corresponding changes in humidity, they would be insupportable. Last night we went to bed with the thermometer at 70° Fahrenheit, and awakened this morning shivering, the thermometer marking 25°; yet, notwithstanding, our blankets were as dry as though we had slept in a house.

The table land, 150 feet above the river, was covered so thick with large paving pebbles as to make it difficult to get a smooth place to lie upon.

The growth of to-day and yesterday, on the hills and in the valleys, very much resembles that on the Del Norte; the only exceptions being a few new and beautiful varieties of the cactus. After leaving our last night's camp, for a mile, the general appearance, width of the valley, and soil, much resemble the most fertile parts of that river. This, so far, has decidedly the best soil, and the fall of the river being greater, makes it more easy to irrigate.

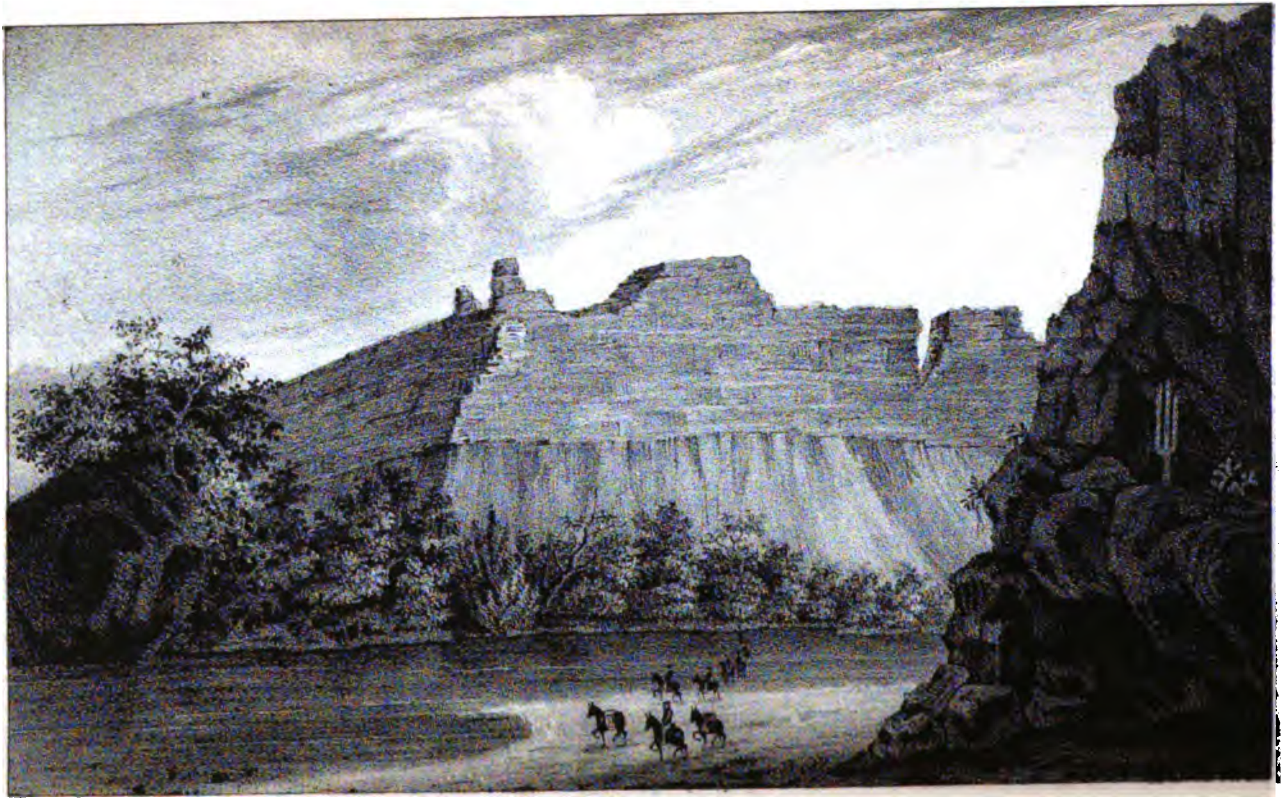
To-day we passed one of the long-sought ruins. I examined it minutely, and the only evidences of handicraft remaining were immense quantities of broken pottery, extending for two miles along the river. There were a great many stones, rounded by attrition of the water, scattered about; and, if they had not occasionally been disposed in lines forming rectangles with each other, the supposition would be that they had been deposited there by natural causes.

October 24.—To-day we laid by to recruit. Although the moon was not in a favorable position, I availed myself of the opportunity to get a few lunar distances; 18 circum-meridian altitudes of Beta Aquarii, and 12 altitudes of Polaris, give for the latitude of the place 32° 44′ 52″, and 8 distances between ☾ and Fomalhaut give for the longitude 109° 22′ 00″. We feasted to-day on the blue quail and teal, and at night Stanly came in with a goose. "Signs" of beaver and deer were very distinct; these, with the wolf, constitute the only animals yet traced on the river.

October 25.—The general character of the country is much the same as before represented; but towards camp it broke into irregular and fantastic-looking mountains. A rose-colored tint was imparted to the whole landscape, by the predominance of red feldspar. The road became broken and difficult, as it wound its way around two short cañons.

We were now approaching the regions made famous in olden times by the fables of Friar Marcos, and eagerly did we ascend every mound, expecting to see in the distance what I fear is but the fabulous "Casa Montezuma." Once, as we turned a sharp hill, the bold outline of a castle presented itself, with the tops of the walls horizontal, the corners vertical, and apparently one front bastioned. My companion agreed with me that we at last beheld this famed building; on we spurred our unwilling brutes; restless for the show, I drew out my telescope, when to my disappointment a clay butte, with regular horizontal seams, stood in the place of our castle; but to the naked eye the delusion was complete. It is not impossible that this very butte, which stands on an imposing height in the centre of a vast amphitheatre of turreted hills, has been taken by the trappers, willing to see, and more especially to report, marvellous things for the "Casa Montezuma." The Indians here do not know the name Aztec. Montezuma is the outward point in their chronology; and as he is supposed to have lived and reigned for all time preceding his disappearance, so do they speak of every event preceding the Spanish conquest as of the days of Montezuma.

The name, at this moment, is as familiar to every Indian, Puebla, Apache and Navajoe as that of our Saviour or Washington is to us. In the person of Montezuma, they unite both qualities of divinity and patriot.



VIEW ON THE GILA

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FOUNDATIONS.

We passed to-day the ruins of two more villages similar to those of yesterday. The foundation of the largest house seen yesterday was 60 by 20 feet; to-day, 40 by 30. About none did we find any vestiges of the mechanical arts, except the pottery; the stone forming the supposed foundation was round and unhewn, and some cedar logs were also found about the houses, much decayed, bearing no mark of an edged tool. Except these ruins, of which not one stone remained upon another, no marks of human hands or foot-step have been visible for many days, until to-day we came upon a place where there had been an extensive fire. Following the course of this fire, as it bared the ground of the shrubbery, and exposed the soil, &c., to view, I found what was to us a very great vegetable curiosity, a cactus, 18 inches high, and 18 inches in its greatest diameter, containing 20 vertical volutes, armed with strong spines. When the traveller is parched with thirst, one of these split open, will give sufficient liquid to afford relief. Several of these cacti were found torn from the earth, and lying in the dry bed of a stream.

These and the mezquite, prosopis odorata, and prosopis glandulosa, now form the principal growth. Under the name mezquite, the voyageur comprises all the acacia and prosopis family.

Last night, about nine o'clock, I heard the yell of a wolf, resembling that of a four months old pup. In a few minutes there was a noise like distant thunder. "Stampede!" shouted a fellow, and in an instant every man was amongst the mules. With one rush they had broken every rope; and this morning, when we started, one of our mules was missing, which gave us infinite annoyance. Our party is so economically provided that we could not afford to lose even a mule, and I left four men to look it up, who did not rejoin us till night.

A question arose involving a serious point of mountain law, which differs somewhat from prairie law. One of my party captured a beautiful dun colored mule, which was claimed by another party; the one claiming the prize for having first seen the animal and then catching it with the lasso. The other pleaded ownership of the rope, used as a lasso, as his title. It was settled to the satisfaction of the first.

The mule was one which Carson had left on his way out, and on being asked why he did not claim it, he said it was too young to be useful in packing, and as we now had plenty of beef, it would not be required for food, and he did not care about it.

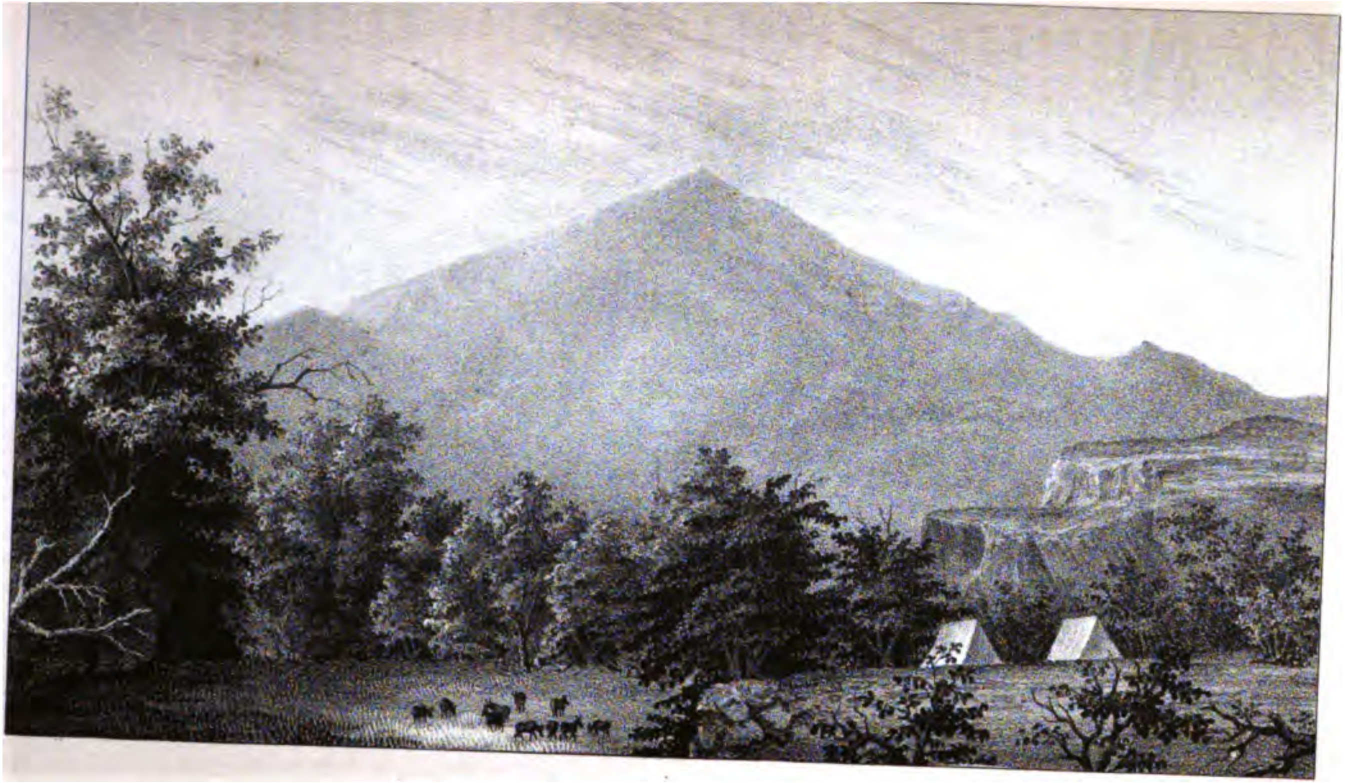
October 26.—Soon after leaving camp, the banks of the river became gullied on each side by deep and impassable arroyos. This drove us insensibly to the mountains, until at length we found ourselves some thousand feet above the river, and it was not until we had made sixteen miles that we again descended to it. This distance occupied eight and a half hours of incessant toil to the men, and misery to our best mules. Some did not reach camp at all, and when the day dawned one or two, who had lost their way, were seen on the side of the mountain, within a few steps of a high precipice, from which it required some skill to extricate them. The men named this pass "the Devil's turnpike," and I see no reason to change it. The whole way was a succession of steep ascents and descents, paved with sharp, angular fragments of basalt and trap. The metallic clink of spurs, and the rattling of the mule shoes, the high, black peaks, the deep dark ravines, and the unearthly looking cacti, which stuck out from the rocks like the ears of Mephistophiles, all favored the idea that we were now treading on the verge of the regions below. Occasionally a mule gave up the ghost, and was left as a propitiatory tribute to the place. This day's journey cost us some twelve or fifteen mules; one of mine fell headlong down a precipice, and, to the surprise of all, survived the fall.

The barometric height was taken several times to-day. Long and anxious was my study of these mountains, to ascertain something of their general direction and form. Those on the north side swept in something like a regular curve from our camp of last night to the mouth of the San Carlos, deeply indented in two places by the ingress into the Gila of the Prieto (Black) and Azul (Blue) rivers. Those on the south, where we passed, were a confused mass of basalt and trap, and I could give no direction to the axis of maximum elevation. They seemed to drift off to the southeast. Wherever the eye wandered, huge mountains were seen of black, volcanic appearance, of very compact argillaceous limestone, tinged at times with scarlet from the quantities of red feldspar. Through these the Gila (now swift) has cut its narrow way with infinite labor, assisted by the influx of the Prieto, the Azul and San Carlos rivers. As the story goes, the Prieto flows down from the mountains, freighted with gold. Its sands are said to be full of this precious metal. A few adventurers, who ascended this river hunting beaver, washed the sands at night when they halted, and were richly rewarded for their trouble. Tempted by their success, they made a second trip, and were attacked and most of them killed by the Indians. My authority for this statement is Londeau, who, though an illiterate man, is truthful.

October 27.—After yesterday's work we were obliged to lay by to-day. The howitzers came up late in the afternoon. They are small, mounted on wheels ten feet in circumference, which stand apart about three feet, and with the assistance of men on foot, are able to go in almost any place a mule can go.

I strolled a mile or two up the San Carlos, and found the whole distance, it has its way in a narrow cañon, worn from the solid basalt. On either side, in the limestone under the basalt were immense cavities, which must have been at times the abodes of Indians and the dens of beasts. The remains of fire and the bones of animals attested this. Near its mouth we found the foundation of a rectangular house, and on a mound adjacent that of a circular building, a few feet in diameter. The ruin was probably that of a shepherd's house, with a circular building adjoining as a look-out, as there was no ground in the neighborhood which was suited for irrigation. Both these ruins were of round unhewn stones, and the first was surrounded by pieces of broken pottery. Digging a few feet brought us to a solid mass which was most likely a dirt floor, such as is now used by the Spaniards.

In my walk I encountered a settlement of tarantulas; as I approached, four or five rushed to the front of their little caves in an



VIEW OF M^{T} GRAHAM

Lith by F. Weber & Co Balto

attitude of defence. I threw a pebble at them, and it would be hard to imagine, concentrated in so small a space, so much expression of defiance, rage, and ability to do mischief, as the tarantula presents.

Our camp was near an old Apache camp. The carcasses of cattle in every direction betokened it to have been the scene of a festival after one of their forays into the Spanish territory.

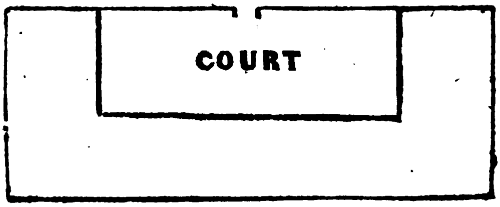
The Gila at this place is much swollen by the affluence of the three streams just mentioned, and its cross section here is about 70 feet by 4. The waters change their color, and are slightly tainted with salt; indeed, just below our camp there came from the side of an impending mountain, a spring so highly charged with salt as to be altogether unpalatable. Several exquisite ferns were plucked at the spring, and a new green-barked acacia, covering the plains above the river bed, but vegetation generally was very scarce; this is the first camp since leaving the Del Norte, in which we have not had good grass.

At 8*h*. 40*m*., a meteor of surpassing splendor started under the constellation Lyra, about 20 degrees above the horizon, and went off towards the south, projected against a black cloud.

The clouds interfered with my observations; but such as they were, 12 altitudes of Polaris, 9 of alpha Andromedæ and 9 of alpha Lyræ, and 16 distances between the ☽ and alpha Pegasi, gave the latitude of the camp 32° 53′ 16″, and the longitude 109° 31′ 34″.

October 28.—One or two miles' ride, and we were clear of the Black mountains, and again in the valley of the Gila, which widened out gradually to the base of Mount Graham, abreast of which we encamped. Almost for the whole distance, twenty miles, were found at intervals the remains of houses like those before described. Just before reaching the base of Mount Graham, a wide valley, smooth and level, comes in from the southeast. Up this valley are trails leading to San Bernadino, Fronteras and Tucsoon. Here also the trail by the Ojo Cavallo comes in, turning the southern abutments of the Black mountains, along which Capt. Cooke is to come with his wagons.

At the junction of this valley with the Gila are the ruins of a large settlement. I found traces of a circular wall 270 feet in circumference. Here also was one circular enclosure of 400 yards. This must have been for defence. In one segment was a triangular shaped indenture, which we supposed to be a well. Large mezquite now grow in it, attesting its antiquity. Most of the houses are rectangular, varying from 20 to 100 feet front; many were of the form of the present Spanish houses, thus:



Red cedar posts were found in many places, which seemed to detract from their antiquity, but for the peculiarity of this climate, where vegetable matter seems never to decay. In vain did we search for some remnant which would enable us to connect the inhabitants of these long deserted buildings with other races. No mark of an edge tool could be found, and no remnant of any household or family utensils, except the fragments of pottery which were every where strewed on the plain, and the rude corn grinder still used by the Indians. So great was the quantity of this pottery, and the extent of ground covered by it, that I have formed the idea it must have been used for pipes to convey water. There were about the ruins quantities of the fragments of agate and obsidian, the stone described by Prescott as that used by the Aztecs to cut out the hearts of their victims. This valley was evidently once the abode of busy, hard-working, people. Who were they? And where have they gone? Tradition among the Indians and Spaniards does not reach them.

I do not think it improbable that these ruins may be those of comparatively modern Indians,* for Venegas says: "The father Jacob Sedelmayer, in October, 1744, set out from his mission, (Tubutuma,) and after travelling 80 leagues, reached the Gila, where he found six thousand Papagos, and near the same number of Pimos and Coco Maricopas;" and the map which he gives of this country, although very incorrect, represents many Indian settlements and missions on this river. His observations, however, were confined to that part of the Gila river near its mouth.

Great quantities of green-barked acacia grew on the table lands, and also the chamiza, wild sage and mezquite; close to the river, cotton-wood and willow. We found, too, amongst many other plants, the eriodictyon Californicum, several new grasses and a sedge, very few of which have been seen on our journey.

We saw the trail of cannon up the valley very distinct; that of an expedition from Sonora against the Indians, which was made a few years since without achieving any results.

Wherever the river made incisions, was discoverable a metamorphic, close grained, laminated sandstone, and in many places were seen buttes of vitrified quartz, (semi-opal.)

October 29.—The dust was knee deep in the rear of our trail; the soil appeared good, but, for whole acres, not the sign of vegetation was to be seen. Grass was at long intervals, and, when found, burned to cinder. A subterraneous stream flowed at the foot of Mount Graham, and fringed its base with evergreen. Every where there were marks of flowing water, yet vegetation was so scarce and crisp that it would be difficult to imagine a drop of water had fallen since last winter. The whole plain, from 3 to 6 miles wide, is within the level of the waters of the Gila, and might easily be irrigated, as it no doubt was by the former tenants of these ruined houses.

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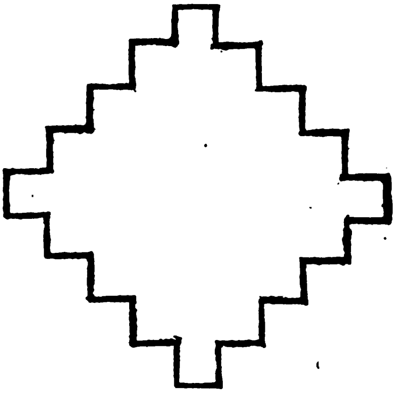
*Since these notes were written, a very interesting lettter was received from the venerable Mr. Gallatin connected with the history of these ruins. The letter, with my reply, will be found in the Appendix.

The crimson tinted Sierra Carlos skirted the river on the north side the whole day, and its changing profiles formed subjects of study and amusement. Sometimes we would trace a Gothic steeple; then a horse; now an old woman's face; and, again, a veritable steamboat; but this required the assistance of a light smoky cloud, drifting to the east, over what represented the chimney stack. Wherever the river abraded its banks, was seen, in horizontal strata, a yellowish argillaceous limestone.

October 30.—Mount Turnbull, terminating in a sharp cone, had been in view down the valley of the river for three days. To-day about three o'clock, p. m., we turned its base, forming the northern terminus of the same chain in which is Mt. Graham.

Half a mile from our camp of last night were other very large ruins which appeared, as well as I could judge, (my view being obstructed by the thick growth of mezquite,) to have been the abode of five or ten thousand souls. The outline of the buildings and the pottery presented no essential difference from those already described. But about eleven miles from the camp, on a knoll, overlooked in a measure by a tongue of land, I found the trace of a solitary house, somewhat resembling that of a field work *en cremallière.* The enclosure was complete, and the faces varied from ten to thirty feet. The accompanying cut will give a more accurate idea than words.



Clouds had been seen hovering over the head of Mount Turnbull; and as we passed, the beds of the arroyos leading from it were found to be damp, showing the marks of recent running water.

Last night, about dusk, one of my men discovered a drove of wild hogs, and this morning we started on their trail, but horse flesh had now become so precious that we could not afford to follow any distance from our direction, and although anxious to get a genuine specimen of this animal, we gave up the chase and dropped in the rear of the column. The average weight of these animals is about 100 pounds, and their color invariably light pepper and salt. Their flesh is said to be palatable, if the musk which lies near the back part of the spine is carefully removed.

Many "fresh signs" of Indians were seen, but, as on previous days, we could not catch a glimpse of them. They carefully avoided us. This evening, however, as Robideaux unarmed was riding in advance, he emerged suddenly from a cavity in the ground, thickly masked by mezquite. He had discovered two Indians on horseback within twenty yards of him. The interview was awkward to both parties, but Robideaux was soon relieved by the arrival of the head of our column. The Indians were thrown into the greatest consternation; they were tolerably mounted, but escape was hopeless; two more miserable looking objects I never beheld; their legs (unlike the Apaches we left behind) were large and muscular, but their faces and bodies (for they were naked) were one mass of wrinkles, almost approaching to scales. They were armed with bows and arrows, and one with a quiver of fresh cut reeds. Neither could speak Spanish, and the communication was by signs. They were directed to go with us to camp, where they would receive food and clothing; but they resolutely refused, evidently thinking certain death awaited them, and that it would be preferable to meet it then than suffer suspense. The chief person talked all the time in a tongue resembling more the bark of a mastiff, than the words of a human being. Our anxiety to communicate to the tribe our friendly feeling, and more especially our desire to purchase mules, was very great; but they were firm in their purpose not to follow, and much to their surprise, (they seemed incapable of expressing joy,) we left them and their horses untouched.

They were supposed by some to be the Cayotes, a branch of the Apaches, but Londeau thought they belonged to the tribe of Tremblers, who acquired their name from their emotions at meeting the whites.

Observed to-night 12 altitudes of Polaris for latitude, and measured 9 lunar distances for longitude.

Lat. 33° 12′ 10″ Long. 110° 20′ 46″

October 31.—To-day we were doomed to another sad disappointment. Reaching the San Francisco about noon, we unsaddled to refresh our horses and allow time to look up a trail by which we could pass the formidable range of mountains through which the Gila cuts its way, making a deep cañon impassable for the howitzers. A yell on the top of a distant hill announced the presence of three well mounted Indians, and persons were sent out to bring them in. Our mules were now fast failing, and the road before us unknown. These Indians, if willing, could supply us with mules and show us the road. Our anxiety to see the result of the interview was, consequently, very great. It was amusing, and at the same time very provoking. They would allow but one of our party to approach. Long was the talk by signs and gestures; at length they consented to come into camp, and moved forward about a hundred yards, when a new apprehension seemed to seize them, and they stopped. They said, as well as could be understood, that the two old men we met yesterday had informed their chief of our presence, and wish to obtain mules; that he was on his way with some, and had sent them ahead to sound a parley. They were better looking, and infinitely better conditioned, than those we met yesterday, resembling strongly the Apaches of the copper mines, and like them decked in the plundered garb of the Mexicans.

The day passed, but no Indians came; treacherous themselves, they expect treachery in others. At everlasting war with the rest of mankind, they kill at sight all who fall in their power. The conduct of the Mexicans to them is equally bad, for they decoy and kill the Apaches whenever they can. The former governor of Sonora employed a bold and intrepid Irishman, named Kirker, to hunt the Apaches. He had in his employment whites and Delaware Indians, and was allowed, besides a per diem, $100 per scalp, and $25 for a prisoner. A story is also told of one Johnson, an Englishman, an Apache trader, who, allured by the reward, induced a number of these people to come to his camp, and placed a barrel of flour for them to help themselves; when the crowd was thickest of men, women, and children, he fired a six pounder amongst them from a concealed place and killed great numbers.

13 circum-meridian altitudes of beta Aquarii, and 10 altitudes of Polaris give the latitude of this camp 33° 14′ 29″. The longitude by 12 lunar distances E. and W. is 110° 30′ 21″.

November 1.—No alternative seemed to offer but to pursue Carson's old trail sixty miles over a rough country, without water, and two, if not three days' journey. Under this, in their shattered condition, our mules must sink. We followed the Gila river six or seven miles, when it became necessary to leave it, how long was uncertain. Giving our animals a bite of the luxurious grama on the river banks, we filled every vessel capable of holding water, and commenced the jornada. The ascent was very rapid, the hills steep, and the footing insecure. After travelling five or six miles, ascending all the way, we found trails from various directions converging in front of us, evidently leading to a village or a spring; it proved to be the last. The spring consisted of a few deep holes, filled with delicious water, overgrown with cotton-wood; and, although the grass was not good, we determined to halt for the night, as the howitzers were not yet up, and it was doubtful when we should meet with water again. I took advantage of the early halt to ascend, with the barometer, a very high peak overhanging the camp, which I took to be the loftiest in the Piñon Lano range on the north side of the Gila.

Its approximate height was only 5,724 feet above the sea. The view was very extensive; rugged mountains bounded the entire horizon. Very far to the northeast was a chain of mountains covered with snow, but I could not decide whether it was the range on the east side of the Del Norte or the Sierras Mimbres. Near the top of this peak the mezcal grew in abundance, and with the stalk of one 25 feet long we erected a flag-staff. Here, too, we found huge masses of the conglomerate before described, apparently as if it had been arrested in rolling from an impending height, but there was no point higher than this for many miles, and the intervening ravines were deep. Lower down we found a large mass of many thousand tons of the finer conglomerate, the shape of a truncated pyramid standing on its smallest base. It appeared so nicely balanced, a feather might have overthrown it. A well levelled seat of large slabs of red ferruginous sandstone, altered by heat, indicated we were not on untrodden ground. It was the watch-tower of the Apache; from it he could track the valley of the Gila beyond the base of Mount Graham.

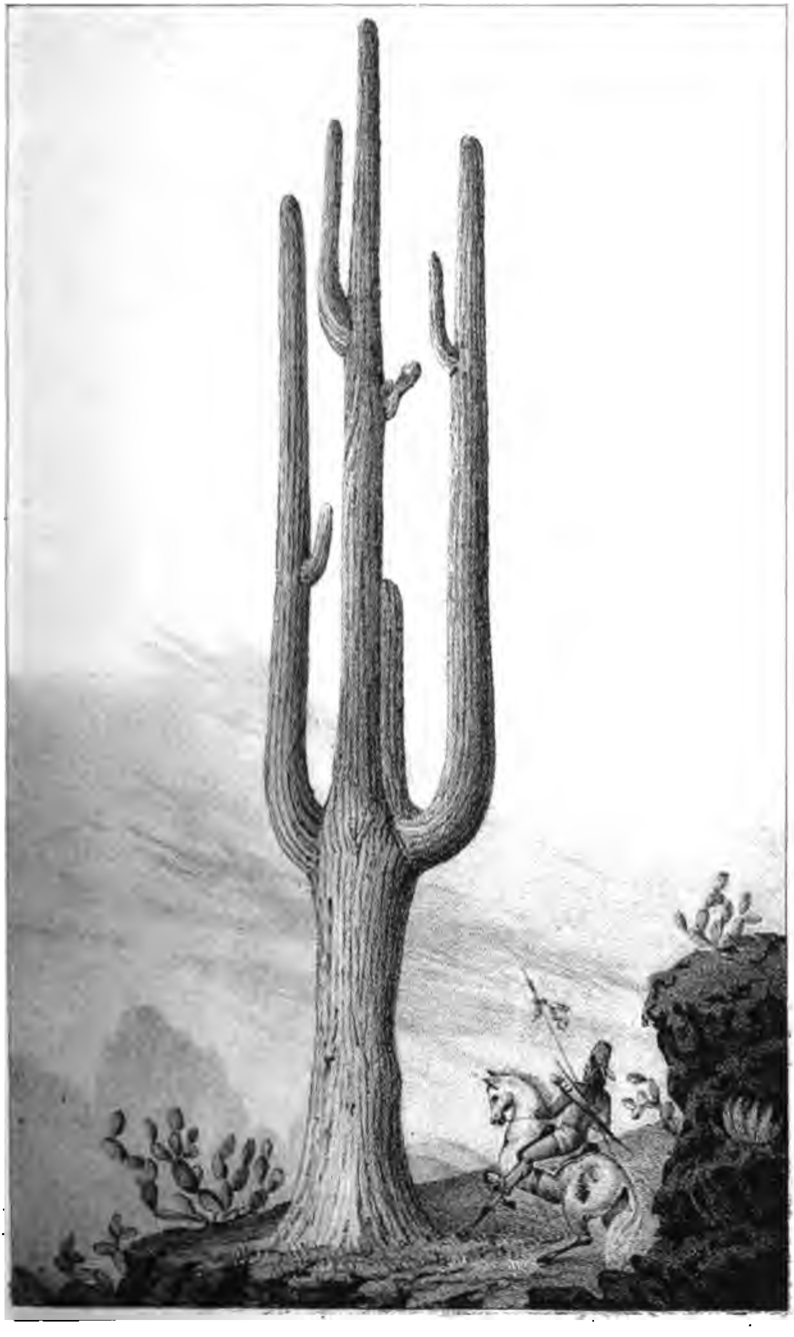
At the point where we left the Gila, there stands a cereus six feet in circumference, and so high I could not reach half way to the top of it with the point of my sabre by many feet; and a short distance up the ravine is a grove of these plants, much larger than the one I measured, and with large branches. These plants bear a saccharine fruit much prized by the Indians and Mexicans. "They are without leaves, the fruit growing to the boughs. The fruit resembles the burr of a chesnut and is full of prickles, but the pulp resembles that of the fig, only more soft and luscious." In some it is white, in some red, and in others yellow, but always of exquisite taste.

On the hills we found a new shrub bearing a delicious nutritious nut, and in sufficient abundance to form an article of food for the Apaches, mezcal and the fruit of the Agave Americana.

The formation near the mouth of the San Francisco is diluvid, overlaying a coarse grained highly calcareous sandstone and limestone. The mountains were chiefly of granite with red feldspar, and near our camp was discernible a stratum of very compact argillaceous limestone, dipping nearly vertically to the west.

November 2.—The call to water sounded long before day-light, and we ate breakfast by the light of the moon; the thermometer at 25°. As day dawned we looked anxiously for the howitzers, which were beginning to impede our progress very much. My camp was pitched on the opposite side of a ravine, some distance apart from the main camp, the horses were grazing on the hill side still beyond and out of sight. We were quietly waiting for further orders, when our two Mexican herdsmen came running into camp, much alarmed and without their arms, exclaiming: "The Indians are driving off the mules. "To arms" was shouted, and before I could loosen a pistol from the holster my little party were in full run to the scene of alarm, each with his rifle. On turning the hill we found the horses tranquilly grazing, but the hill overlooking them was lined with horsemen. As we advanced, one of the number hailed us in Spanish, saying he wished to have "a talk."

They were Apaches, and it had been for some time our earnest desire to trade with them, and hitherto we had been unsuccessful. "One of you put down your rifle and come to us," said the Spanish-tongued Indian. Londeau, my employé before mentioned, immediately complied: I followed; but before reaching half way up the steep hill, the Indian espied in my jacket the handle of a large horse pistol. He told me I must put down my pistol before he would meet me. I threw it aside and proceeded to the top of the hill, where, although he was mounted and surrounded by six or eight of his own men armed with rifles and arrows, he received me



CEREUS GIGANTEUS

(Engelmann Appendix No. 2 Cactaceae)

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Foundations.

with great agitation. The talk was long and tedious. I exhausted every argument to induce him to come into camp. His principal fear seemed to be the howitzers, which recalled at once to my mind the story I had heard of the massacre by Johnson. At last a bold young fellow, tired of the parley, threw down his rifle, and with a step that Forrest in Metamora might have envied, strode off towards camp, piloted by Carson. We were about to follow, when the chief informed us it would be more agreeable to him if we remained until his warrior returned.

The ice was now broken; most of them seeing that their comrade encountered no danger, followed one by one. They said they belonged to the tribe of Piñon Lanos; that "they were simple in head but true of heart." Presents were distributed; they promised a guide to pilot us over the mountain, five miles distant, to a spring with plenty of good grass, where they engaged to meet us next day with 100 mules.

The mezcal flourishes here; and at intervals of a half a mile or so we found several artificial craters, into which the Indians throw this fruit, with heated stones, to remove the sharp thorns and reduce it to its saccharine state.

I observed last night for latitude and time, and our position is in latitude 33° 14′ 54″, longitude 110° 45′ 06″. Our camp was on the head of a creek which after running in a faint stream one hundred yards, disappeared below the surface of the earth. On its margin grew a species of ash unknown in the United States, and the California plane tree, which is also distinct in species from our sycamore.

November 3.—Our expectations were again disappointed; the Indians came, but only seven mules were the result of the day's labor, not a tenth of the number absolutely required.

Our visiters to-day presented the same motley group we have always found the Apaches. Amongst them was a middle-aged woman, whose garrulity and interference in every trade was the annoyance of Major Swords, who had charge of the trading, but the amusement of the by-standers.

She had on a gauze-like dress, trimmed with the richest and most costly Brussels lace, pillaged no doubt from some fandango-going belle of Sonora; she straddled a fine grey horse, and whenever her blanket dropped from her shoulders, her tawny form could be seen through the transparent gauze. After she had sold her mule, she was anxious to sell her horse, and careered about to show his qualities. At one time she charged at full speed up a steep hill. In this, the fastenings of her dress broke, and her bare back was exposed to the crowd, who ungallantly raised a shout of laughter. Nothing daunted, she wheeled short round with surpising dexterity, and seeing the mischief done, coolly slipped the dress from her arms and tucked it between the seat and the saddle. In this state of nudity she rode through camp, from fire to fire, until, at last, attaining the object of her ambition, a soldier's red flannel shirt, she made her adieu in that new costume.

A boy about 12 years of age, of uncommon beauty, was among our visiters. Happy, cheerful and contented, he was consulted in every trade, and seemed an idol with the Apaches. It required little penetration to trace his origin from the same land as the gauze of the old woman. We tried to purchase him, but he said it was *long*, *long*, since he was captured and that he had no desire to leave his master, who, he was certain, would not sell him for any money. All attempts were vain, and the lad seemed gratified both at the offer to purchase, and the refusal to sell. Here we found the mountains chiefly of red ferruginous sandstone, altered by heat.

November 4.—Six miles from our camp of last night we reached a summit, and then commenced descending again rapidly towards the Gila, along a deeply cañoned valley, the sands of which were black with particles of oxide and peroxide of iron. Near the summit the hills on each side were of old red sandstone, with strata sloping to the southwest at an angle of 25°, and under this were strata of black slate and compact limestone, and then granite.

In the ravines we found, at places, a luxuriant growth of sycamore, ash, cedar, pine, nut-wood, mezcal, and some walnut, the edible nut again, Adam's needle, small evergreen oak and cottonwood, and a gourd, the cucumis perennis.

There was every indication of water, but none was procured on the surface; it could no doubt have been found by digging.

The last six or eight miles of our roure was down the dry bed of a stream, in a course east of south, and our day's journey did not gain much in the direction of California. It was necessary to ascend the river a mile in search of grass, and then we got but an indifferent supply. Except in the two camps nearest to Mount Turnbull, and the one at the San Carlos, we have never before, since leaving Santa Fé, had occasion to complain of the want of grass.

We encamped in a grove of cacti of all kinds; amongst them the huge pitahaya, one of which was fifty feet high.

The geological formation on this slope of the Piñon Lano mountains was: 1st. Conglomerate of sandstone and pebbles; then red sandstone in layers a foot thick; then granite, very coarse. The depth of the two first was many hundred feet, and in some places its stratification much deranged. Many large masses of sandstone, with thin seams of vitrified quartz.

In the dry creek down which we travelled, we saw a cave of green sandstone, in which a fire had been built; for what purpose I cannot conjecture, as it was too small to admit a man.

The Apaches gave us to understand that a marauding party of their people were in Sonora. The broad fresh trail of cattle and horses leading up the arroyo, induces the belief that they have returned—successful, of course.

Last night was mild, the thermometer at 63° Fahrenheit; and, what was very unusual here, the heavens were overcast, which prevented my getting the rate of the chronometers.

Although we have had no rain except at Mount Graham, where

A TRIBUTARY OF THE GILA

Lith by E. Weber & Co Balto.

we had a shower which scarcely sufficed to lay the dust, yet the whole face of the country bears marks of rains, and running water, met with in no other part of our journey. The absence of vegetation will, in some measure, account for the deep incisions made by running water in the earth.

November 5.—The howitzers did not reach camp last night, yet the grass was so bad, and our beds, on the round pebbles everywhere covering the surface of the ground, so uncomfortable, it was determined to move camp.

The Gila now presents an inhospitable look; the mountains of trap, granite, and red sandstone, in irregular and confused strata, but generally dipping sharply to the south, cluster close together; and one ignorant of the ground could not tell from what direction the river came, or in what direction it flowed onwards to its mouth. The valley, not more than 300 feet from base to base of these perpendicular mountains, is deep, and well grown with willow, cottonwood, and mezquite.

At several places, perpendicular walls of trap dyke projected from the opposite side of the river, giving the idea that the river waters had once been dammed up, and then liberated by the blow of a giant; for the barrier was shattered—not worn away. In the course of six miles we had crossed and re-crossed the river twice as many times, when we left it by turning abruptly up a dry ravine to the south. This we followed for three miles, and crossed a ridge at the base of Saddle-Back mountain, (so named by us from its resemblance to the outline of a saddle,) and descended by another dry creek to the San Pedro, running nearly north.

The valley of this river is quite wide, and is covered with a dense growth of mezquite, (acacia prosopis,) cotton-wood, and willow, through which it is hard to move without being unhorsed. The whole appearance gave great promise, but a near approach exhibited the San Pedro, an insignificant stream a few yards wide, and only a foot deep.

For six miles we followed the Gila. The pitahaya and every other variety of cactus flourished in great luxuriance. The pitahaya, tall, erect, and columnar in its appearance, grew in every crevice from the base to the top of the mountains, and in one place I saw it growing nearly to its full dimensions from a crevice not much broader than the back of my sabre. These extraordinary looking plants seem to seek the wildest and most unfrequented places.

The range of mountains traversed to-day is the same we have been in for some days, and is a continuation of that of Mount Graham, which turns sharply westward from Turnbull's peak, carrying with it the Gila.

Saddle-Back is an isolated peak of red sandstone that has every appearance of having once formed the table land, and being harder than the surrounding surface, having withstood the abrasion of water.

The uplands were covered as usual with mezquite, chimàza, ephydræ, the shrub with the edible nut, and cactus, of which there was a new and beautiful variety. In the cañon we heard in advance of us the crack of a rifle; on coming up we found that old Francisco, one of the guides, had killed a calf, left there, doubtless, by the Apaches.

The dry creek by which we crossed to the San Pedro river was the great highway leading from the mountain fastnesses into the plains of Santa Cruz, Santa Anna, and Tucsoon, frontier towns of Sonora. Along this valley was distinctly marked the same fresh trail, noted yesterday, of horses, cattle and mules.

The bed of this creek was deeply cut, and turned at sharp angles, forming a zigzag like the bayoux laid by sappers in approaching a fortress, each turn of which (and they were innumerable) formed a strong defensive position. The Apache once in possession of them is secure from pursuit or invasion from the Mexican.

Since the 1st November, we have been traversing, with incredible labor and great expenditure of mule power, the stronghold of these mountain robbers, having no other object in view than making our distance westward; yet here we are at this camp, only five seconds of time west of camp 89, at Disappointment creek, and one minute and four seconds west of our camp at the mouth of the San Francisco.

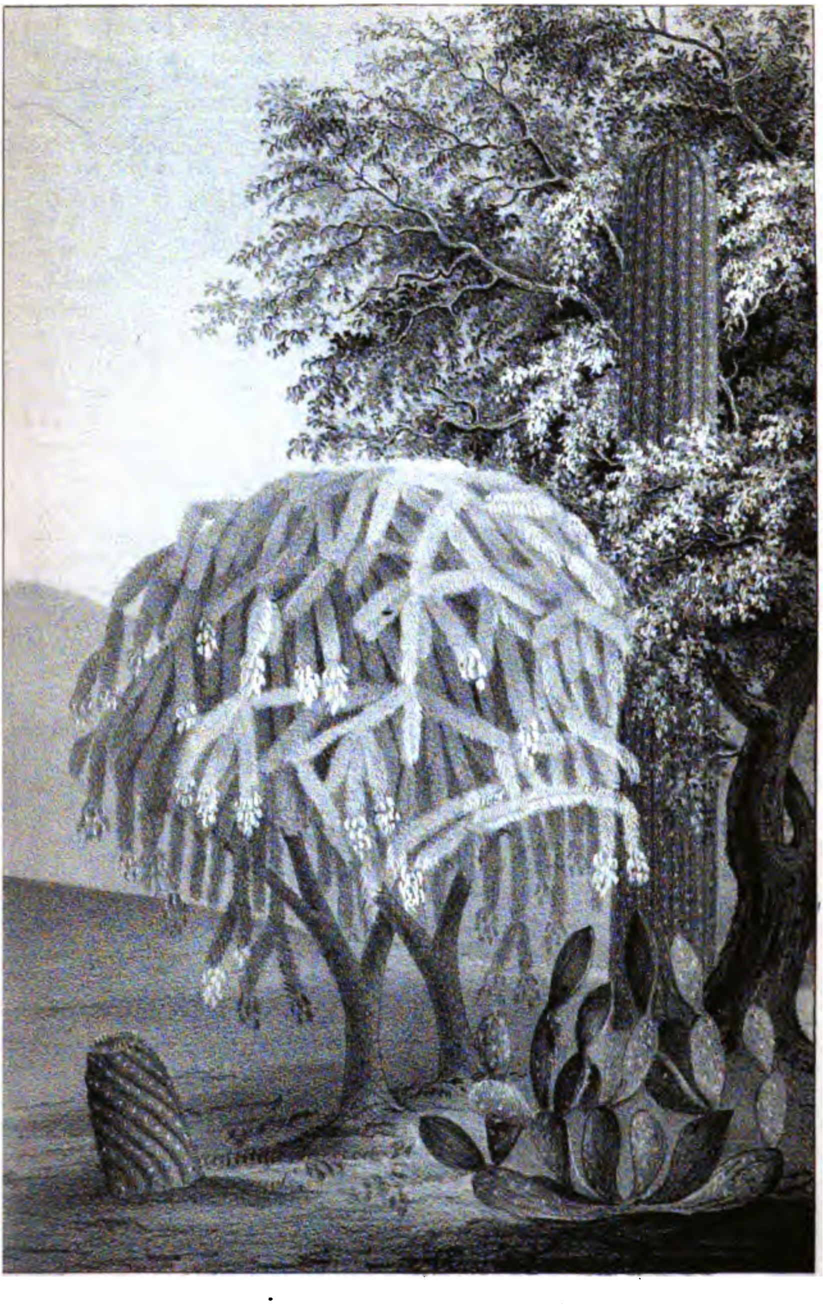
Nature has done her utmost to favor a condition of things which has enabled a savage and uncivilized tribe, armed with the bow and lance, to hold as tributary powers three fertile and once flourishing states, Chihuahua, Sonora, and Durango, peopled by a Christian race, countrymen of the immortal Cortez. These states were at one time flourishing, but such has been the devastation and alarm spread by these children of the mountains, that they are now losing population, commerce and manufactures, at a rate, which, if not soon arrested, must leave them uninhabited.

November 6.—For the double purpose of allowing the howitzers to come up, and to recruit our mules, it is decided this shall be a day of rest. The grama is good, but sparsely scattered over the hills, and it is necessary to loosen every animal and let them graze at will.

We are yet 500 miles from the nearest settlement, and no one surveying our cavalry at this moment would form notions favorable to the success of the expedition.

Except a few saddle mules, the private property of officers, which have been allowed to run loose, every animal in camp is covered with patches, scars, and sores, made by the packs in the unequal motion caused by the ascent and descent of steep hills.

The failure of the Apaches to bring in their mules, was a serious disappointment, and entirely justifies the name given to the creek, where they agreed to meet us. Besides, being the only means of transportation, they are, in extremity, to serve us as food, and the poor suffering creatures before us, give no very agreeable impression of the soup which their meat will furnish. However grave the subject may appear, it is the common source of merriment. All seem to anticipate it as a matter of course, and the constant recurrence of the mind to the idea, will no doubt accustom us to it, and make mule as acceptable as other soup.



GROUP OF PLANTS EXHIBITING THE VEGETATION ON THE GILA

Lith. by E. Weber & Co. Balto

In the sandy arroyos where our fires burn, that look as if they had been formed but a year or two since, was broken pottery, and the remains of a large building, similar in form, substance and apparent antiquity to those so often described, Strolling over the hills alone, in pursuit of seed and geological specimens my thoughts went back to the States, and when I turned from my momentary aberrations, I was struck most forcibly with the fact that not one object in the whole view, animal, vegetable or mineral, had any thing in common with the products of any State in the Union, with the single exception of the cotton-wood, which is found in the western States, and seems to grow wherever water flows from the vertebral range of mountains of North America; this tree we found growing near the summit of the Piñon Lano range of mountains; indeed, always where a ravine had its origin.

In one view could be seen clustered, the Larrea Mexicana, varieties of cacti, green wood acacia, chamiza, prosopis odorata, and a new variety of sedge, and then large open spaces of bare gravel.

The only animal seen were lizards, scorpions, and tarantulas.

I made elaborate observations for time and latitude, and for longitude by measurement of lunar distances. Anxious to observe eclipses of Jupiter's satelites, I determined once more to try the small telescope with which the satelites of Jupiter could just be discerned. I strained my eyes for two nights in succession to see if I could discover the moment of immersion and emersion of I and III satellites of Jupiter, which were visible from our camp. My efforts were fruitless, and the result to myself is a distressing nervous affection of the eye; which may injure the correctness of my other observations of this night.

The resulting latitude of the place is 32° 57′ 43″,
longitude " " 7*h*. 23*m* 19*s*.

Rate of the chronometer 2075, losing 12″ 7*s*. per day.

The height by barometer 2115 feet above the sea.

The latitude was deduced from 13 circum-meridian altitudes of beta Aquarii, and 12 altitudes of Polaris. The longitude from 8 distances between the alpha Arietis and the ☽, 9 of Regulus and the ☽ and 5 of Aldebaran and the ☽.

November 7.—About two miles from our camp the San Pedro joins the Gila just as the latter leaps from the mouth of the cañon. The place of meeting is a bottom three miles wide seeming a continuation of that of the Gila.

It is principally of deep dust and sand, over grown with cotton-wood, mezquite, chamiza, willow, and the black willow. In places there are long sweeps of large paving pebbles, filled up with drift wood, giving the appearance of having been overflowed by an impetuous torrent. The hills on both sides of the river, still high, but now farther off, and covered to the top with soil producing the mezquite and pitahaya, as the day advanced, began to draw in closer, and before it closed, had again contracted the valley to a space little more than sufficient for the river to pass; and at halt, after making seventeen miles, we found ourselves encompassed by hills much diminished in height, but not in abruptness. The road, except the deep dust which occasionally gave way and lowered a mule to his knees, was good, that is, there were no hills to scale. The river was crossed and re-crossed four times. At 12 and 14 miles there were good patches of grama, burned quite yellow, but for most of the way, and at our camp, there was little or no grass, and our mules were turned loose to pick what they could of rushes and willow along the margin of the stream.

Wherever the formation was exposed along the river, it was a conglomerate of sandstone, lime and pebbles, with deep caverns.

Nearly opposite our camp of this date, and about one-third the distance up the hill there crops out ore of copper and iron, easily worked, the carbonate of lime and calcareous spar. A continuation of the vein of ore was found on the side where we encamped, and a large knoll strewed with what the Spaniards call "*guia*" the English of which is "guide to gold."

The night has set in dark and stormy; the wind blows in gusts from the southwest; and the rain falling in good earnest, mingled with the rustling noise of the Gila, which has now become swift and impetuous, produces on us, who have so long been accustomed to a tranquil atmosphere, quite the impress of a tempest. We have been so long without rain as to cease to expect or make provision against it, and the consequence is the greatest difficulty in getting the men to provide coverings for the destructible portion of our rations.

Three Indians hailed us just before reaching camp, and after much parley were brought in. They feasted heartily, and promised to bring in mules. At first they denied having any; but after their appetites were satisfied, their hearts opened, and they sent the youngest of their party to their town, which was at the head of the dry creek of our camp, of the night before last. The fellow went on his way as directed, till he met the howitzers, which so filled him with surprise and consternation that he forgot his mission, and followed the guns to camp in mute wonder. These people are of the Piñon Lano (piñon wood) tribe, and we had been told by the Pinoleros (pinole eaters) that the chief of this band had mules.

Flights of geese and myriads of the blue quail were seen, and a flock of turkies from which we got one.

The river bed, at the junction of the San Pedro, was seamed with tracks of deer and turkey; some "signs" of beaver and one trail of wild hogs.

Our camp was on a flat sandy plain, of small extent, at the mouth of a dry creek, with deep washed banks, giving the appearance of containing at times a rapid and powerful stream, although no water was visible in the bed. At the junction, a clear, pure stream flowed from under the sand. From the many indications of gold and copper ore at this place, I have named it Mineral creek; and I doubt not a few years will see flat-boats descending the river from this point to its mouth, freighted with its precious ores.

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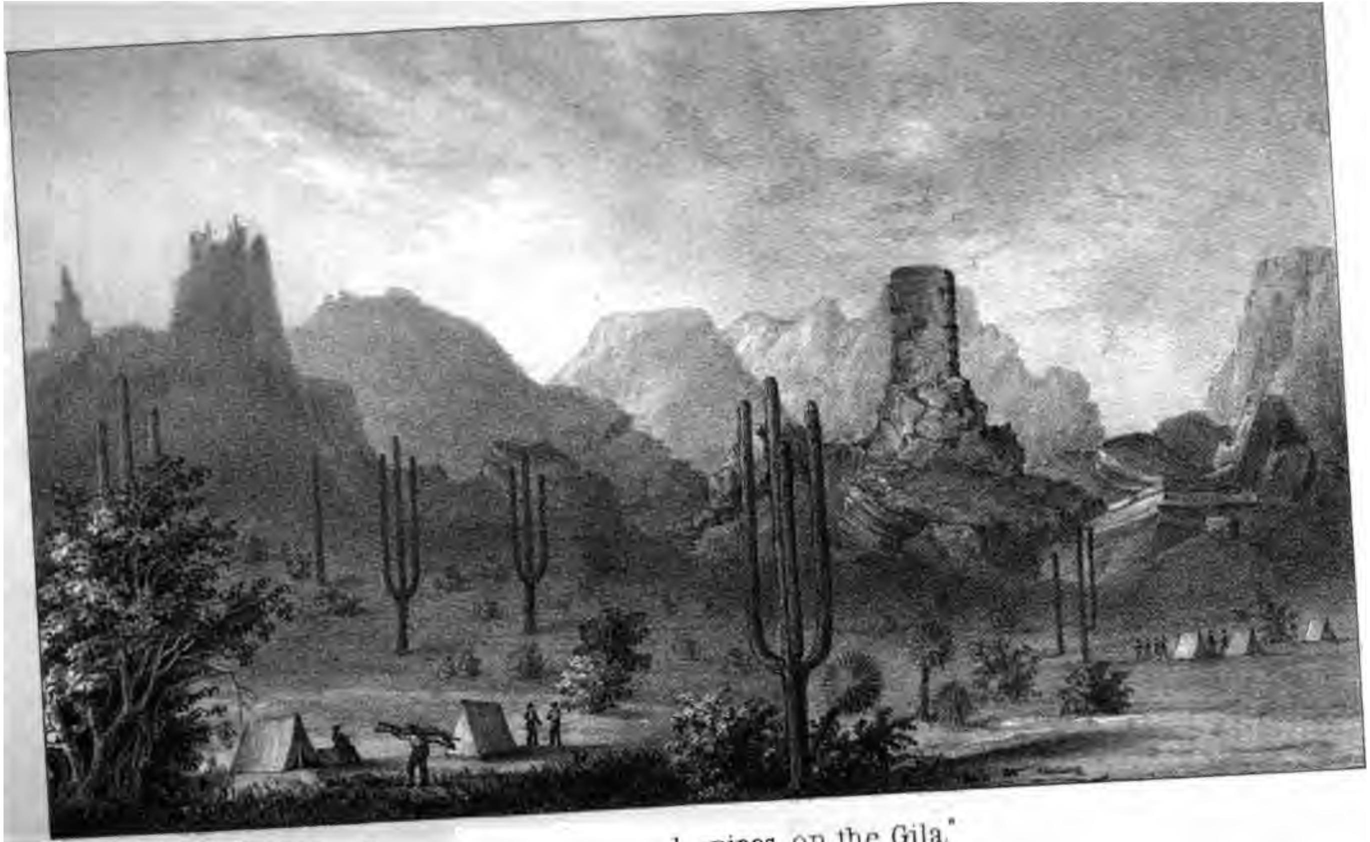

"Chain of natural spires on the Gila"

Lith. by E Weber & Co Balto

There was a great deal of pottery about our camp, and just above us were the supposed remains of a large Indian settlement, differing very slightly from those already described.

November 8.—The whole day's journey was through a cañon, and the river was crossed twelve or fifteen times. The sand was deep, and occasionally the trail much obstructed by pebbles of paving-stone. The willow grew so densely in many places as to stop our progress, and oblige us to look for spots less thickly overgrown, through which we could break.

The precipices on each side were steep; the rock was mostly granite and a compact sandy limestone, with occasional seams of basalt and trap; and towards the end of the day, calcareous sand-stone, and a conglomerate of sandstone, feldspar, fragments of basalt, pebbles, &c. The stratification was very confused and irregular, sometimes perfectly vertical but mostly dipping to the southwest, at an angle of 30°. Vast boulders of pure quartz at times obstructed our way, and the river, in places, was paved with those of less magnitude.

About two miles from camp, our course was traversed by a seam of yellowish colored igneous rock, shooting up into irregular spires and turrets, one or two thousand feet in height. It ran at right angles to the river, and extended to the north, and to the south, in a chain of mountains as far as the eye could reach. One of these towers was capped with a substance, many hundred feet thick, disposed in horizontal strata of different colors, from deep red to light yellow. Partially disintegrated, and laying at the foot of the chain of spires, was a yellowish calcareous sandstone, altered by fire, in large amorphous masses.

For a better description of this landscape, see the sketch by Mr. Stanly.

To the west, about a mile below us, and running parallel to the first, is another similar seam, cut through by the Gila, at a great butte, shaped like a house. The top of this butte appears to have once formed the table land, and is still covered with vegetation. Through both these barriers the river has been conducted by some other means than attrition. Where it passes the first, it presents the appearance of a vast wall torn down by blows of a trip hammer. Under to-day's date, in appendix No. 2, will be found many interesting plants, but the principal growth was as usual, pitahaya, Acacia, Prosopis, and Obione canescens.

The latitude of this camp, which is within a mile of the spot where we take a final leave of the mountains, is, by the mean of the observations on north and south stars, Polaris and beta Aquarii, 33° 05′ 40″; its longitude, derived by measurement, and also by chronometric difference of meridian between this and the camp of November 5th, is 111° 13′ 10″ west of Greenwich, and the height of the river at this point above the sea, as indicated by the barometer, 1,751 feet.

At night, for the first time since leaving Pawnee Fork, I was interrupted for a moment in my observations, by moisture collecting on the glass of my horizon shade, showing a degree of humidity in the atmosphere not before existing. In the States there is scarcely a night where the moisture will not collect on the glass exposed to the air, sufficient in two or three minutes to prevent the perfect transmission of light.

November 9.—The effect of last night's dampness was felt in the morning, for, although the thermometer was only 37° the cold was more sensible than in the dry regions at 25°.

We started in advance of the command to explore the lower belt of mountains by which we were encompassed. The first thing we noticed in the gorge was a promontory of pitch-stone, against which the river impinged with fearful force, for it was now descending at a rapid rate. Mounting to the top of the rock, on a beautiful table, we found sunk six or eight perfectly symmetrical and well-turned holes, about ten inches deep and six or eight wide at top; near one, in a remote place, was a pitch-stone well turned and fashioned like a pestle. These could be nothing else than the corn-mills of long extinct races. Above this bed of pitch-stone, a butte of calcareous sand-stone shot up to a great height, in the seams of which were imbedded beautiful crystals of quartz. Turning the sharp angle of the promontory, we discovered a high perpendicular cliff of calcareous spar and baked argillaceous rock, against which the river also butted, seamed so as to represent distinctly the flames of a volcano. A sketch was made of it, and is presented with these notes. On the side of the river opposite the igneous rocks, the butte rose in perpendicular and confused masses.

This chain continued, not parallel, as I supposed, to the first described barrier, but circled round to the east, and united with it. It also united on the north side, forming a basis three or four miles in diameter, in which we encamped last night. Except a few tufts of Larrea Mexicana, these hills were bare of vegetation. Away off to the south, and bordering on the banks of the river, covering the surface of the ground for one or two feet, was an incrustation of black cellular lava or basalt, like that seen about the Raton. Nothing more was wanted to give the idea of an immense extinct volcano. Through the centre of the crater the Gila now pursues its rapid course.

The Gila at this point, released from its mountain barrier, flows off quietly at the rate of three miles an hour into a wide plain, which extends south almost as far as the eye can reach. Upon this plain mezquite, chamiza, the green acacia, prosopis, artemisia, obione canescens, and pitahaya, were the only vegetation. In one spot only we found a few bunches of grass; more than four-fifths of the plain was destitute of vegetation; the soil, a light brown loose sandy earth, I supposed contained something deleterious to vegetation*

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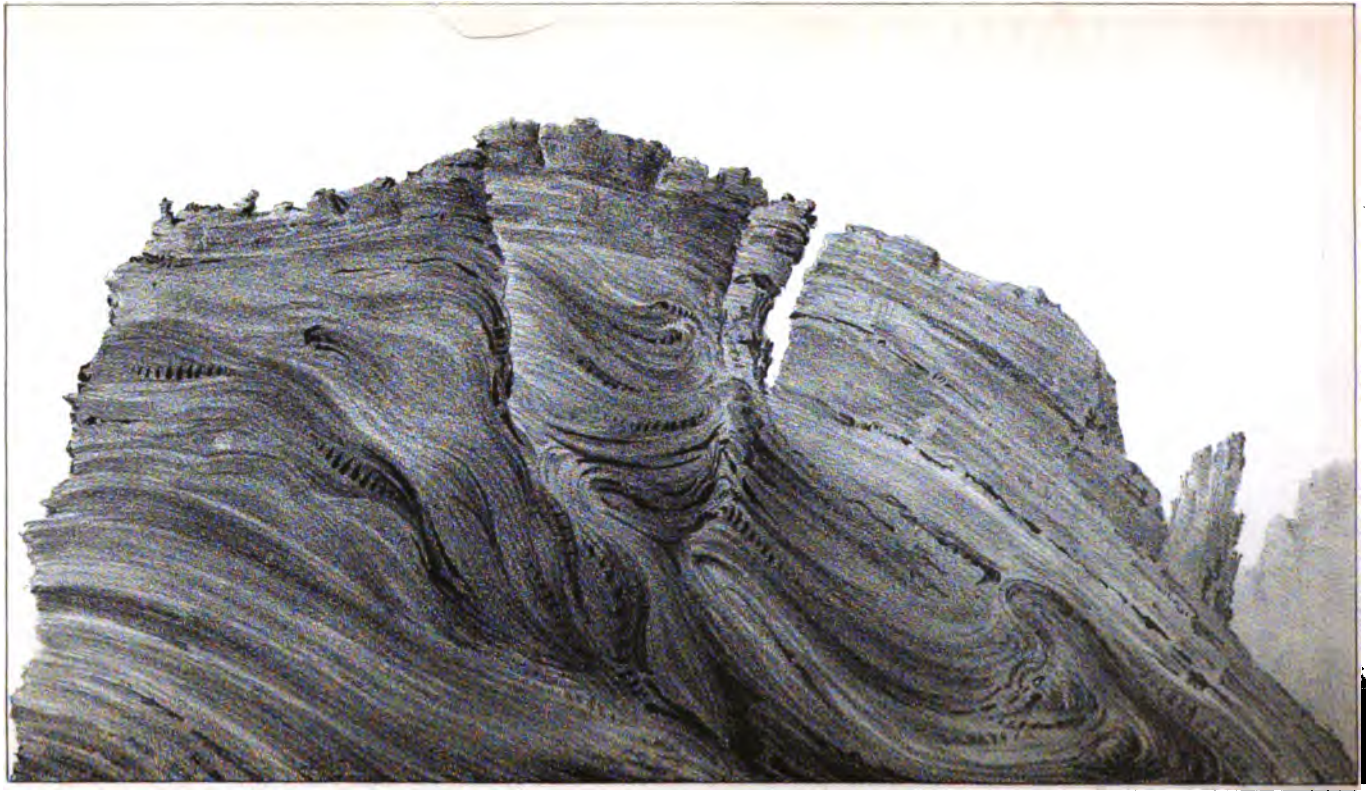
*A specimen of this soil was submitted to Professor Fraser, who says: "It is a light brown, loose sandy earth containing scarcely anything soluble in water, the solution giving only faint indications of common salt and carbonate of lime. A very small portion of iron pyrites is also contained in it, but I imagine its want of fertility may more properly be attributed to its deficiency in organic matters."



THE FIRE PLACE ROCK

Lith. by E. Weber & Co. Balto.

We made our noon halt at the grass patch. At this place were the remains of an immense Indian settlement; pottery was everywhere to be found, but the remains of the foundations of the houses were imbedded in dust. The outlines of the zequias, by which the soil was irrigated, were sometimes quite distinct.

The soil was moist, and wherever the foot pressed the ground the salts of the earth effloresced, and gave it the appearance of being covered with frost. In this way the numberless tracks of horses and other animals, which had at times traversed the plains, were indelible, and could be traced for great distances, by the eye, in long white seams.

We found fresh trails of horses, which might be those of General Castro, or the Indians. When leaving California, Castro's determination, as we learn, was to go to Sonora, beat up recruits, and return. Our route might easily be reached, for we are now marching along a road everywhere accessible, and within three days' march of the settlements of Sonora and the fort at Tucsoon, said to be regularly garrisoned by Mexican soldiers.

We passed the deserted lodges of Indians, and, at one place, remote from the lodges, we saw thirteen poles set up in a sort of incantation formula; twelve on the circumference of a circle, twenty feet in diameter, and one in the centre. Radii were drawn on the ground from the centre pole to each one in the periphery of the circle. It was the figuring of some medicine man of the Apaches or Pimos, we could not tell which, for it was on neutral ground, about the dividing line of the possessions claimed by each.

After leaving the mountains all seemed for a moment to consider the difficulties of our journey at an end. The mules went off at a frolicsome pace, those which were loose contending with each other for precedence in the trail. The howitzers, which had nearly every part of their running gear broken and replaced, were, perhaps, the only things that were benefitted by the change from the mountains to the plains. These were under the charge of Lieutenant Davidson, whose post has been no sinecure. In overcoming one set of difficulties we were now to encounter another. In leaving the mountains we were informed that we bade adieu to grass, and our mules must henceforth subsist on willow, cotton-wood, and the long green ephedra.

November 10.—The valley on the southern side of the Gila still grows wider. Away off in that direction, the peaks of the Sonora mountains just peep above the horizon. On the north side of the river, and a few miles from it, runs a low chain of serrated hills. Near our encampment, a corresponding range draws in from the southeast, giving the river a bend to the north. At the base of this chain is a long meadow, reaching for many miles south, in which the Pimos graze their cattle; and along the whole day's march were remains of zequias, pottery, and other evidences of a once densely populated country. About the time of the noon halt, a large pile, which seemed the work of human hands, was seen to the left. It was the remains of a three-story mud house, 60 feet square, pierced for doors and windows. The walls were four feet thick, and formed by layers of mud, two feet thick. Stanly made an elaborate sketch of every part; for it was, no doubt, built by the same race that had once so thickly peopled this territory, and left behind the ruins.

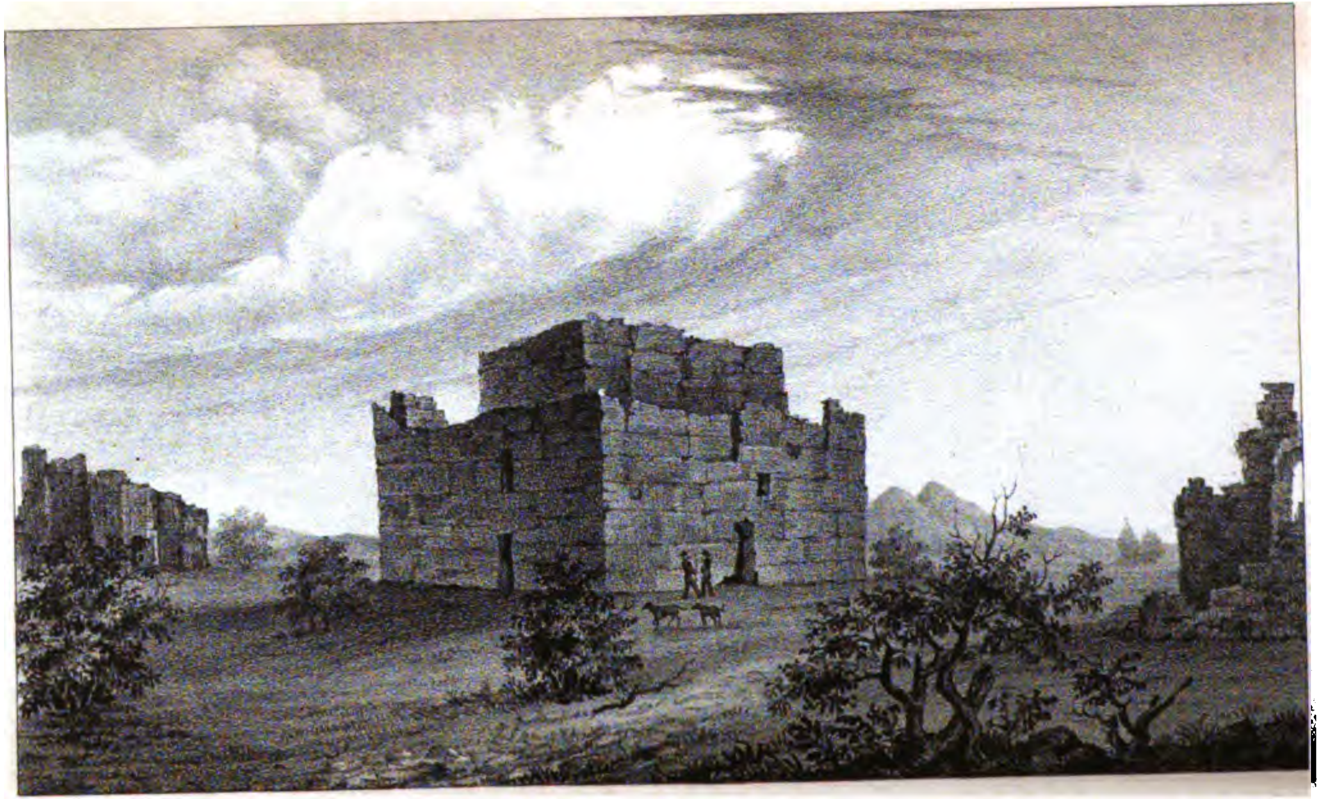
We made a long and careful search for some specimens of household furniture, or implement of art, but nothing was found except the corngrinder, always met with among the ruins and on the plains. The marine shell, cut into various ornaments, was also found here, which showed that these people either came from the sea coast or trafficked there. No traces of hewn timber were discovered; on the contrary, the sleepers of the ground floor were round and unhewn. They were burnt out of their seats in the wall to the depth of six inches. The whole interior of the house had been burnt out, and the walls much defaced. What was left bore marks of having been glazed, and on the wall in the north room of the second story were traced the following hieroglyphics. [Lost.]

Where we encamped, eight or nine miles from the Pimos village, we met a Maricopo Indian, looking for his cattle. The frank, confident manner in which he approached us was in strange contrast with that of the suspicious Apache. Soon six or eight of the Pimos came in at full speed. Their object was, to ascertain who we were, and what we wanted. They told us the fresh trail we saw up the river was that of their people, sent to watch the movements of their enemies, the Apaches. Being young, they became much alarmed on seeing us, and returned to the town, giving the alarm that a large body of Apaches were approaching.

Their joy was unaffected at seeing we were Americans, and not Apaches. The chief of the guard at once despatched news to his chief, of the result of his reconnoissance. The town was nine miles distant, yet, in three hours, our camp was filled with Pimos loaded with corn, beans, honey, and zandias (water melons.) A brisk trade was at once opened. This was my observing night; but the crowd of Indians was great, and the passing and repassing, at full speed so continuous, that I got an indifferent set of observations.

The camp of my party was pitched on the side nearest the town, and we saw the first of these people and their mode of approach. It was perfectly frank and unsuspicious. Many would leave their packs in our camp and be absent for hours, theft seeming to be unknown among them. With the mounted guard, which first visited us, was a man on foot, and he appeared to keep pace with the fleetest horse. He was a little out of breath when he reached us, but soon recovering, told us he was the interpreter to Juan Antonio Llunas, chief of the Pimos.

We were taking some refreshments at the time, and invited him to taste of them. The effect was electric; it made his bright, intelligent eye flash, and loosened his tongue. I asked him, among other things, the origin of the ruins of which we had seen so many; he said, all he knew, was a tradition amongst them, "that in bygone days, a woman of surpassing beauty resided in a green spot in the mountains near the place where we were encamped. All the men admired, and paid court to her. She received the tributes of their devotion, grain, skins, &c., but gave no love or other favor in return.



THE RUINS OF THE CASA GRANDE

(The founders of which are unknown)

Lith. by E. Weber & Co. Balto

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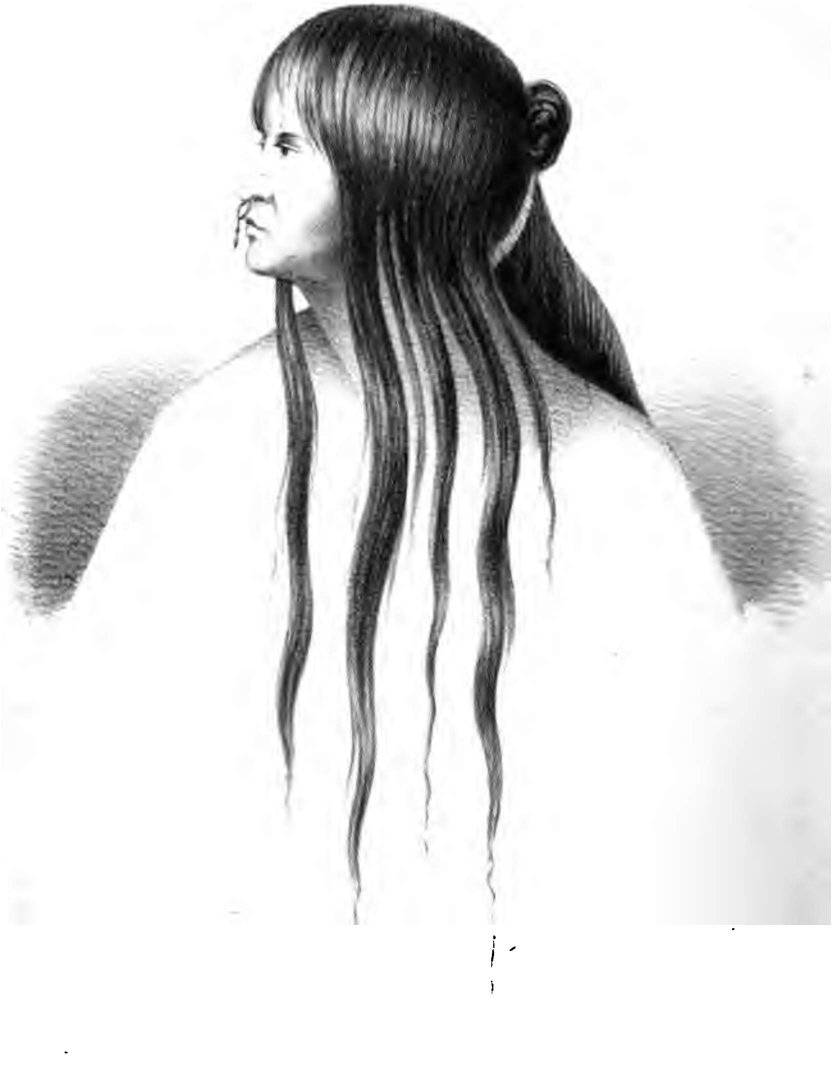


THE INTERPRETER OF THE PIMOS
BY BIRTH A COCO MARICOPAS

Lith. by E. Weber & Co. Balto.

Her virtue, and her determination to remain unmarried were equally firm. There came a drought which threatened the world with famine. In their distress, people applied to her, and she gave corn from her stock, and the supply seemed to be endless. Her goodness was unbounded. One day, as she was lying asleep with her body exposed, a drop of rain fell on her stomach, which produced conception. A son was the issue, who was the founder of a new race which built all these houses."

I told the interpreter repeatedly, he must go and report to the general, but his answer was, "let me wait till I blow a little." The attraction was the aquardente. At length he was prevailed on to go to head-quarters, leaving at our camp his bows and arrows and other matters, saying he would return and pass the night with us.

November 11.—Leaving the column, a few of us struck to the north side of the river, guided by my loquacious friend, the interpreter, to visit the ruins of another Casa Montezuma. In the course of the ride, I asked him if he believed the fable he had related to me last night, which assigned an origin to these buildings. "No," said he, "but most of the Pimos do. We know, in truth, nothing of their origin. It is all enveloped in mystery."

The casa was in complete ruins, one pile of broken pottery and foundation stone, of the black basalt, making a mound about ten feet above the ground. The outline of the ground plan was distinct enough.

We found the description of pottery the same as ever; and, among the ruins, the same sea shell; one worked into ornaments; also a large bead, an inch and a quarter in length, of bluish marble, exquisitely turned.

We secured to-day our long sought bird, the inhabitant of the mezquite, indigo blue plumage, with top knot and long tail. Its wings, when spread, showing a white ellipse.

Turning from the ruins towards the Pimos village, we urged our guide to go fast, as we wished to see as much of his people as the day would permit. He was on foot, but led at a pace which kept our mules in a trot.

We came in at the back of the settlement of Pimos Indians, and found our troops encamped in a corn field, from which the grain had been gathered. We were at once impressed with the beauty, order, and disposition of the arrangements for irrigating and draining the land. Corn, wheat, and cotton are the crops of this peaceful and intelligent race of people. All the crops have been gathered in, and the stubbles show they have been luxuriant. The cotton has been picked, and stacked for drying on the tops of sheds. The fields are sub-divided, by ridges of earth, into rectangles of about 200 × 100 feet for the convenience of irrigating. The fences are of sticks, wattled with willow and mezquite, and, in this particular, set an example of economy in agriculture worthy to be followed by the Mexicans, who never use fences at all. The houses of the people are mere sheds, thatched with willow and corn stalks.

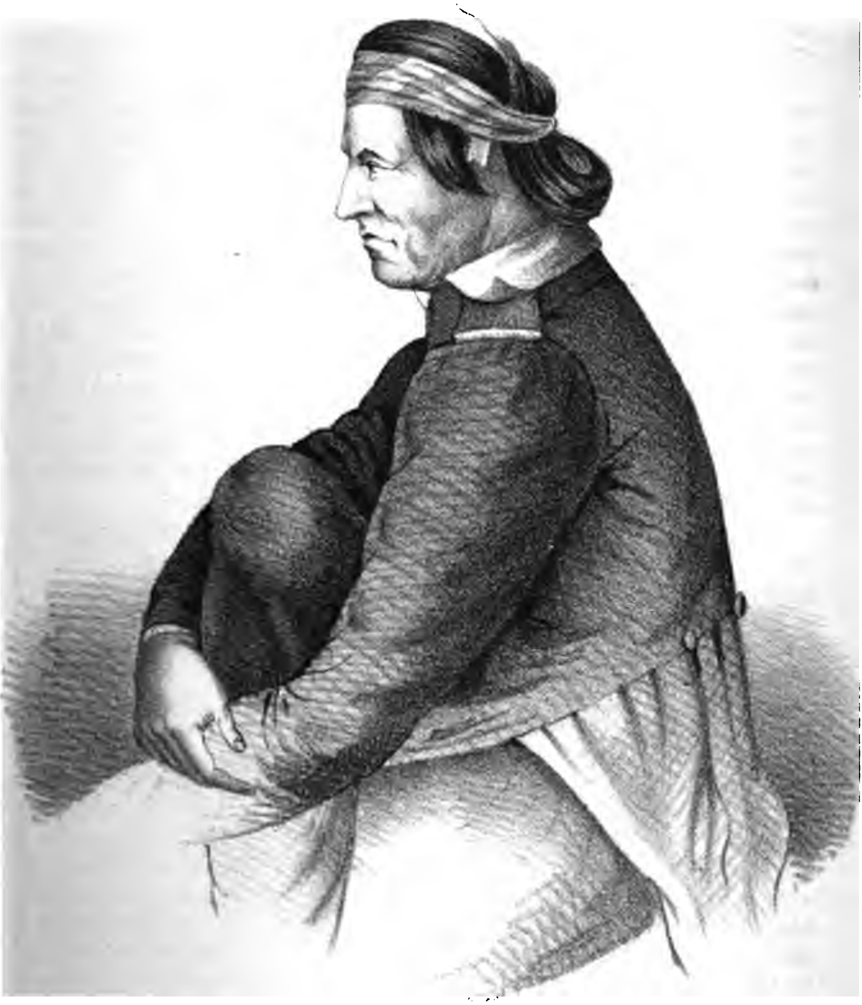
With the exception of the chief, Antonio Llunas, who was clad in cast off Mexican toggery, the dress of the men consisted of a cotton serape of domestic manufacture, and a breech cloth. Their hair was very long, and clubbed up. The women wore nothing but the serape pinned about the loins, after the fashion of Persico's Indian woman on the east side of the Capitol, though not quite so low.

The camp was soon filed with men, women, and children, each with a basket of corn, frijolés, or meal, for traffic. Many had jars of the molasses expressed from the fruit of the Cereus Giganteus. Beads, red cloth, white domestic, and blankets, were the articles demanded in exchange. Major Swords, who had charge of the trading duty, pitched a temporary awning, under which to conduct the business, which had scarcely commenced before this place formed a perfect menagerie, into which crowded, with eager eyes, Pimos, Maricopas, Mexicans, French, Dutch, English, and Americans. As I passed on to take a peep at the scene, naked arms, hands, and legs protruded from the awning. Inside there was no room for bodies, but many heads had clustered into a very small space, filled with different tongues and nations. The trade went merrily on, and the conclusion of each bargain was announced by a grunt and a joke, sometimes at the expense of the quartermaster, but oftener at that of the Pimos.

November 12.—We procured a sufficiency of corn, wheat, and beans from the Pimos, but only two or three bullocks, and neither horses nor mules. They have but few cattle, which are used in tillage, and apparently all steers, procured from the Mexicans. Their horses and mules were not plenty, and those they possessed were prized extravagantly high. One dashing young fellow, with ivory teeth and flowing hair, was seen coming into our camp at full speed, on a wild unruly horse, that flew from side to side as he approached, alarmed at the novel apparition of our people. The Maricopa, for he was of that tribe, was without saddle or stirrups, and balanced himself to the right and left with such ease and grace as to appear part of his horse. He succeeded in bringing his fiery nag into the heart of the camp. He was immediately offered a very advantageous trade by some young officer. He stretched himself on his horse's neck, caressed it tenderly, at the same time shutting his eyes, meaning thereby that no offer could tempt him to part with his charger.

The general gave a letter to Governor Llunas, stating he was a good man, and directing all United States troops that might pass in his rear to respect his excellency, his people, and their property. Several broken down mules were left with him to recruit, for the benefit of Cooke's battalion as it passed along.

To us it was a rare sight to be thrown in the midst of a large nation of what is termed wild Indians, surpassing many of the Christian nations in agriculture, little behind them in the useful arts, and immeasurably before them in honesty and virtue. During the whole of yesterday, our camp was full of men, women, and



JUAN ANTONIO — PIMO HEAD CHIEF.

Lith. by E. Weber & Co. Balto

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children, who sauntered amongst our packs, unwatched, and not a single instance of theft was reported.

I rode leisurely in the rear, through the thatched huts of the Pimos; each abode consists of a dome-shaped wicker-work, about six feet high, and from twenty to fifty feet in diameter, thatched with straw or corn stalks. In front is usually a large arbor, on top of which is piled the cotton in the pod, for drying.

In the houses were stowed water melons, pumpkins, beans, corn, and wheat, the three last articles generally in large baskets; sometimes the corn was in baskets covered with earth, and placed on the tops of the domes. A few chickens and dogs were seen, but no other domestic animals, except horses, mules, and oxen. Their implements of husbandry were the axe, (of steel,) wooden hoes, shovels, and barrows. The soil is so easily pulverized as to make the plough unnecessary.

Several acquaintances, formed in our camp yesterday, were recognized, and they received me cordially, made signs to dismount, and when I did so, offered water melons and pinole. Pinole is the heart of Indian corn, baked, ground up, and mixed with sugar. When dissolved in water, it affords a delicious beverage; it quenches thirst, and is very nutritious. Their molasses, put up in large jars, hermetically sealed, of which they had quantities, is expressed from the fruit of the Cereus Giganteus.

A woman was seated on the ground under the shade of one of the cotton sheds. Her left leg was tucked under her seat and her foot turned sole upwards; between her big toe and the next, was a spindle about 18 inches long, with a single fly of four or six inches. Ever and anon she gave it a twist in a dexterous manner, and at its end was drawn a coarse cotton thread. This was their spinning jenny. Led on by this primitive display, I asked for their loom by pointing to the thread and then to the blanket girded about the woman's loins. A fellow stretched in the dust, sunning himself, rose up leisurely and untied a bundle which I had supposed to be a bow and arrow. This little package, with four stakes in the ground, was the loom. He stretched his cloth and commenced the process of weaving.

We travelled 15½ miles and encamped on the dividing ground between the Pimos and Maricopas. For the whole distance, we passed through cultivated grounds, over a luxuriantly rich soil. The plain appeared to extend in every direction 15 or 20 miles, except in one place about five miles before reaching camp, where a low chain of hills comes in from the southeast, and terminates some miles from the river. The bed of the Gila, opposite the village, is said to be dry; the whole water being drawn off by the zequias of the Pimos for irrigation; but the ditches are larger than is necessary for this purpose, and the water which is not used returns to the bed of the river with little apparent diminution in its volume.

Looking from our camp north, 30° west, you see a great plain with mountains rising in the distance on each side. This prospect had induced some travellers to venture from here in a direct line to

Monterey in California, but there is neither grass nor water on that passage, and thirst and distress overcame, undoubtedly, those who attempted it.

In almost an opposite direction north, 50° east, there is a gap in the mountains through which the Salt river flows to meet the Gila, making with it an acute angle, at a point ten or fifteen miles distant from our camp, bearing northwest. A little north of east, another gap, twenty or thirty miles distant, shows where the Rio San Francisco flows into the Salt river. From the best information I can collect, the San Francisco comes in from the north; its valley is narrow and much cañoned; good grass abounds all the way. Le Voncoeur, one of my party, came down that river in 1844 with a trapping party of forty-eight men. He states that they were much annoyed the whole way by the Apache Indians, a great many of whom reside on that river. Every night they were fired upon, and an attempt made to stampede their mules. Many traps were stolen, and one of their party, an old man, who had been in the mountains forty-five years, was killed by the Indians in this expedition.

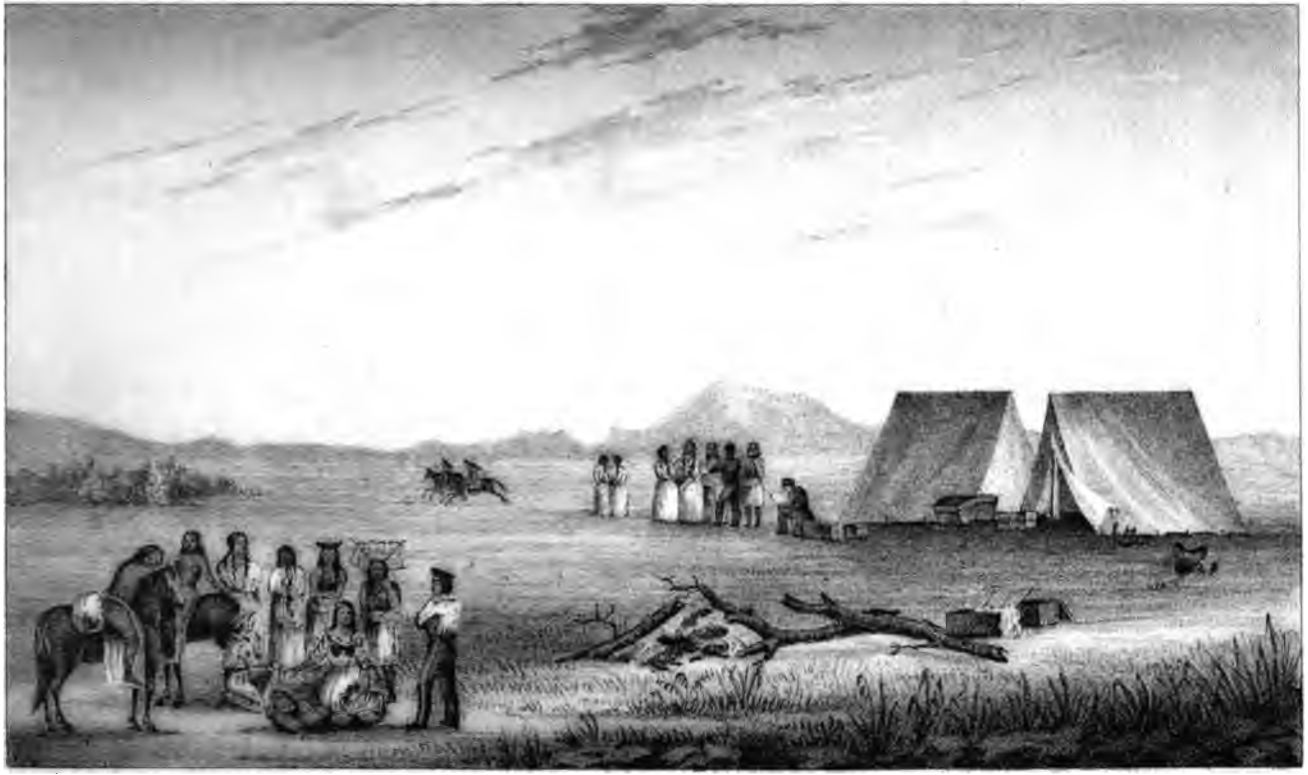
Near the junction of the Gila and Salt rivers, there is a chain of low serrated hills coming in from both sides, contracting the valley considerably. Around the South Spur the Gila turns, making its course in a more southerly direction. To the east, except where the spurs already mentioned protrude, the plain extends as far as the eye can reach. A great deal of the land is cultivated, but there is still a vast portion within the level of the Gila that is yet to be put under tillage. The population of the Pimos and Maricopas together is estimated variously at from three to ten thousand. The first is evidently too low.

This peaceful and industrious race are in possession of a beautiful and fertile basin. Living remote from the civilized world, they are seldom visited by whites, and then only by those in distress, to whom they generously furnish horses and food. Aguardiente (brandy) is known among their chief men only, and the abuse of this, and the vices which it entails, are yet unknown.

They are without other religion than a belief in one great and over-ruling spirit.

Their peaceful disposition is not the result of incapacity for war, for they are at all times enabled to meet and vanquish the Apaches in battle, and when we passed, they had just returned from an expedition in the Apache country to revenge some thefts and other outrages, with eleven scalps and thirteen prisoners. The prisoners are sold as slaves to the Mexicans.

The Maricopas occupy that part of the basin lying between camp 97 and the mouth of the Salt river, and all that has been said of the Pimos, is applicable to them. They live in cordial amity, and their habits, agriculture, religion, and manufactures, are the same. In stature, they are taller; their noses are more aquiline, and they have a much readier manner of speaking and acting. I noticed that most of the interpreters of the Pimos were of this tribe, and also the men we met with in the spy guard



PIMOS & COCO MARICOPAS INDIANS

Though fewer in number, they appear to be superior in intelligence and personal appearance.

Don Jose Messio is their governor, and, like the governor of the Pimos, holds his office by the appointment of the Mexican governor of California. The people have no choice in the selection. Both these Indians are respectable looking old men, and seem to be really worthy of the trust reposed in them.

We had not been long in camp before a dense column of dust down the river announced the approach of the Maricopas, some on foot, but mostly on horseback. They came into camp at full speed, unarmed, and in the most confident manner, bringing water melons, meal, pinole, and salt for trade. The salt is taken from the plains; wherever there are bottoms which have no natural drainage, the salt effloresces and is skimmed from the surface of the earth. It was brought to us both in the crystallized form, and in the form when first collected, mixed with earth.

My camp was selected on the side towards the village, and the constant galloping of horses rendered it difficult for me to take satisfactory observations, which I was desirous of doing, as it is an important station. When I placed my horizon on the ground, I found that the galloping of a horse five hundred yards off affected the mercury, and prevented a perfectly reflected image of the stars, and it was in vain to hope for these restless Maricopas to keep quiet. News got about of my dealings with the stars, and my camp was crowded the whole time.

The latitude of this camp by such observations as the Maricopas would allow me to make, was 33° 09′ 28″, and the longitude 112° 07′ 13″.

November 13 and 14.—With the morning came the Maricopas women, dressed like the Pimos. They are somewhat taller, and one peculiarity struck me forcibly, that while the men had aquiline noses, those of the women were *retroussés*. Finding the trade in meal had ceased, they collected in squads about the different fires, and made the air ring with their jokes and merry peals of laughter. Mr. Bestor's spectacles were a great source of merriment. Some of them formed the idea that with their aid, he could see through their cotton blankets. They would shrink and hide behind each other at his approach. At length, I placed the spectacles on the nose of an old woman, who became acquainted with their use and explained it to the others.

We were notified that a long journey was to be made without finding water, (to cut off an elbow in the river,) and the demand for gourds was much greater than the supply. One large gourd cost me four strings of glass beads, which was thought a high price. The interpreter who guided us to the Casa Montezuma, on the north side of the Gila, said that on the Salt river, about a day's journey and a half, there was one of those buildings standing, complete in all respects except the floors and roof. He said it was very large, with beautiful glazed wall; that the footsteps of the men employed in building the house could yet be seen in the adobe, and that the impresion was that of a naked foot. Whenever a rain comes, the

Indians resort to these old houses to look for trinkets of shells, and a peculiar green stone which I think is nothing more than verde antique.

At 12 o'clock, after giving our horses a last watering, we started off in a southwestern direction to turn the southern foot of the range of hills pointing to the Salt river. Five miles brought us into a grove of the Cereus, which had yielded a plentiful supply of fruit to the Indians. Our way was over a plain of granitic sand ascending gradually and almost imperceptibly. After leaving the Cereus, there was no growth except the Larrea Mexicana, and occasionally, at long intervals, an accacia or inga.

We travelled till long after dark, and dropped down in a dust hole near two large green-barked acacias. There was not a sprig of grass or a drop of water, and during the whole night the mules kept up a piteous cry for both.

There was nothing but the offensive Larrea, which even mules will not touch when so hungry as to eat with avidity the dry twigs of all other shrubs and trees. As soon as the moon rose, at 3, a. m., the bugle sounded to horse, and we were up and pursuing our way. A little after sunrise, we had passed the summit and were descending towards the Gila. This summit was formed by a range of granite hills running southeast, and standing in pinnacles.

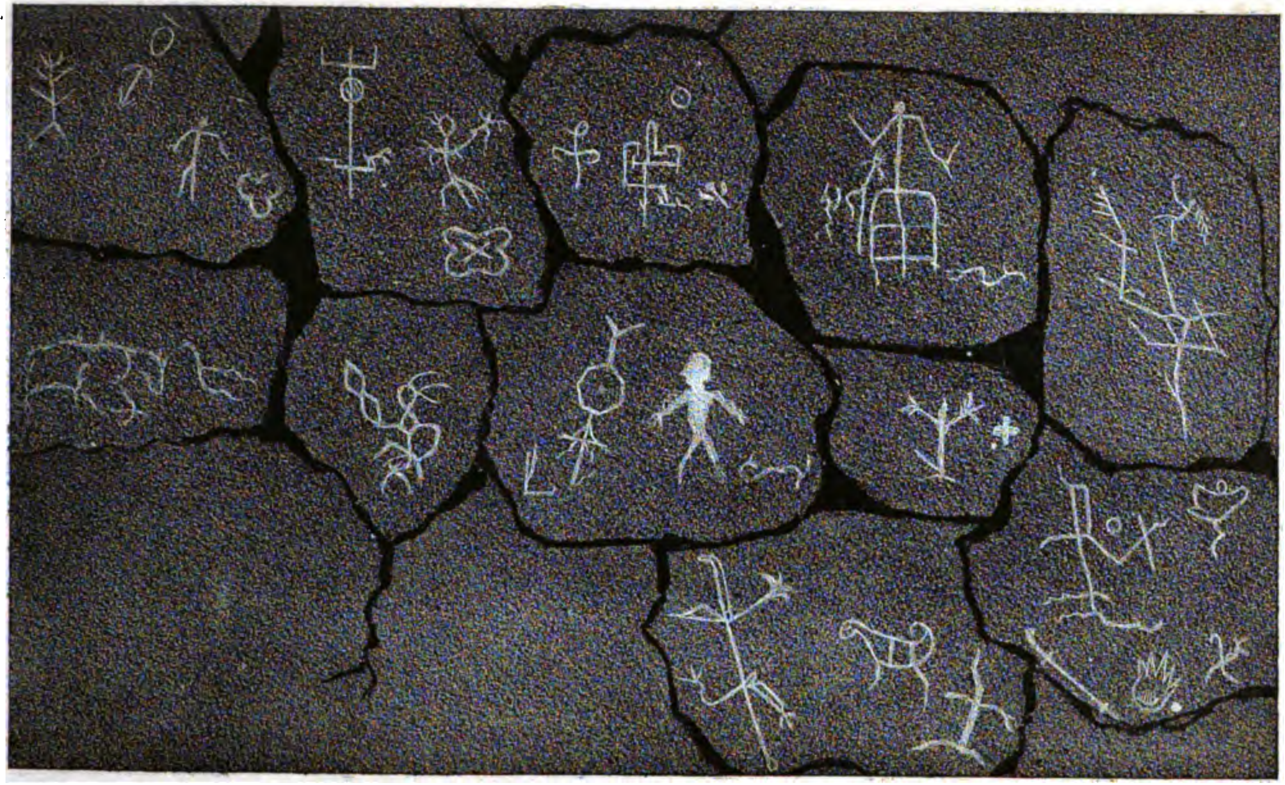
As the sun mounted, the mirage only seen once before since leaving the plains of the Arkansas, now began to distort the distant mountains, which everywhere bounded the horizon into many fantastic shapes. The morning was sharp and bracing, and I was excessively hungry, having given my breakfast, consisting of two biscuits to my still more hungry mule. I was describing to Mr. Warner how much more pleasant it would be to be jogging into Washington after a fox hunt, with the prospect of a hot breakfast, when up rose to our astonished view, on the north side of the Gila, a perfect representation of the capitol, with dome, wings, and portico, all complete. It remained for full twenty minutes with its proportions and outline perfect, when it dwindled down into a distant butte.

We went on briskly to the Gila, whose course, marked by the green cotton-wood, could be easily traced. It looked much nearer than it really was. We reached it after making forty miles from our camp of yesterday.

Our poor brutes were so hungry they would drink no water, but fell to work on the young willows and cane. After letting them bite a few minutes we moved down the river five miles further, to a large and luxuriant patch of paspalum grass, shaded by the acacia and prosopis.

My eyes becoming sore with dust, I took a large object for my southern star to night, the planet Saturn. 16 circum-meridian altitudes of Saturn and 9 altitudes of Polaris give the latitude of the camp 35° 59′ 22″, and the longitude given by the chronometer is 112° 50′ 01″.

November 15.—In the morning the general found the mules so much worsted by the 45 miles journey, without food or water, that



HIEROGLIPHICS

Lith by E Weber & Co. Balto.

he is determined to remain for the day. Most of the mules belonging to my party have travelled 1,800 miles, almost continuously. Two or three times they have all appeared on the eve of death; but a mule's vitality recuperates when life seems to be almost extinct, so I am in hopes the day's rest will revive them sufficiently to enable them to undertake what will be the most distressing part of the journey. From information collected from the Indians and others, it appears that we shall meet with no more grass from this spot to the settlements, estimated 300 miles distant.

This has been a gloomy day in the dragoon camp. The jornada cost them six or eight mules, and those which have survived give little promise of future service. The howitzers make severe draughts on them. Yesterday, within five miles of the river, Lieutenant Davidson was obliged to hitch his private mules to them. An order has been given to-day to dismount one-half the command and reserve the animals for packing.

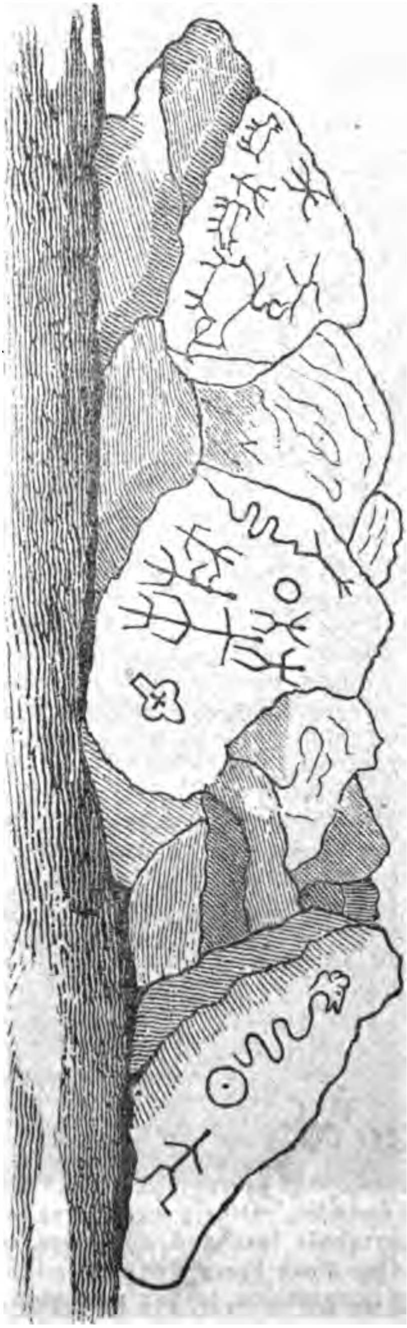
From all accounts there is no difficulty in following the route of the river from camp 97 to this place, and the journey is but a trifle longer; I would, therefore, recommend parties in our rear to get a Coco Maricopa guide and keep the river.

The remains of an old zequia crossed our trail, and the plains were covered with broken pottery. About us there are signs of modern Indian tenements, and the zequia may possibly have been the work of their hands. We know the Maricopas have moved gradually from the gulf of California to their present location, in juxtaposition with the Pimos. They were found so late as the year 1826, at the mouth of the Gila; and Dr. Anderson, who passed from Sonora to California in 1828, found them, as near as we could reckon from his notes, about the place we are now encamped in. The shells found to-day were, in my opinion, evidently brought by the Maricopas from the sea. They differ from those we found among the ruins.

Observed for time to-night and obtained the rates of my chronometers; that of chronometer No. 783, 12*s*. per day, showing a very satisfactory consistency in rate since leaving the mountains.

November 16.—The valley on the south side continues wide, and shows continuously the marks of former cultivation. On the north side the hills run close to the river.

After making ten miles we came to a dry creek, coming from a plain reaching far to the south, and then we mounted the table lands to avoid a bend in the river, made by a low chain of black hills coming in from the southeast. The table land was strewed with fragments of black basalt, interspersed with agate, chalcedony, vitrified quartz, and carbonate of lime. About the summit was a mound of granite boulders, blackened by augite, and covered with unknown characters; the work of human hands. These have been copied. On the ground near by were also traces of some of the figures, showing some of the hieroglyphics, at least, to have been the work of modern Indians. Others were of undoubted antiquity, and the signs and symbols intended, doubtless, to commemorate some great event. One stone bore on it what might be taken, with a little stretch of the imagination, to be a mastodon, a horse, a dog, and a man. Their heads are turned to to the east, and this may commemorate the passage of the aborigines of the Gila on their way south.



Many of the modern symbols are in imitation of the antique, and, doubtless, the medicine men of the present day resort to this mound to invoke their unseen spirits, and work the miracles which enable them to hold their sway amongst their credulous race. There are many more weird and mysterious-looking places than this to be found along the banks of the Gila, and the first attraction to the modern Indian was, without doubt, the strange characters he saw described.

Some of the boulders appear to have been written and re-written upon so often it was impossible to get a distinct outline of any of the characters.

We descended into the broad valley of the Gila, skirted on the south side of the table land, black with basalt pebbles, resting on a stratum of the carbonate of lime upon which the river impinged at every flood, and widened its valley.

The hills on the north side were of red and grey rocks, probably granite, irregular in form, varying from 500 to 1,000 feet. Finding no grass, we loosened our mules among the willows and cane.

November 17.—The route to-day was over a country much the same as that described yesterday. Wherever we mounted to the table lands to cut off a bend in the river, found them dreary beyond description, covered with blocks of basalt, with a few intervals of dwarf growth of Larrea. Now and then a single acacia raised its solitary form and displayed its verdure in the black expanse. We crossed the dry beds of two creeks with sandy bottoms. Under the crust of basalt are usually sandstone and a conglomerate of pebbles, sandstone, and lime. This last is easily undermined by the river, and the basalt or lava then caves in.

The bottoms of the river are wide, rich, and thickly overgrown with willow and a tall aromatic weed, and alive with flights of white brant, (wing tipped with black,) geese, and ducks, with many signs of deer and beaver.

At night I heard the song of the sailors calling the depth of the water, and presently, Williams, Lieutenant Warner's servant, who had been missing all day, came out of the river with the hind quarters of a large buck, perfectly intoxicated with his unexpected success. Twelve miles back, he let his mule loose, went in pursuit of deer, and killed a buck. After lugging the whole of it for two miles, he lightened his load by leaving one-half.

We encamped down in one of the deserted beds of the Gila, where the ground was cracked and drawn into blisters. The night was cold, the thermometer at 6, a. m., 20°.

Latitude of the camp 32° 55′ 52″. Longitude of the camp 113° 25′ 25″.

November 18.—High wind from the northwest all day, showing that there was still a barrier of snow-clad mountains between ourselves and Monterey, which we must turn or scale.

Carson pointed to a flat rock covered with fir, and told that he had slaughtered a fat mule there. The names of several Americans were inscribed on the same rock.

After travelling some ten or twelve miles through the valley, we mounted to the table land, and at 12½ o'clock stopped to graze our horses at a little patch of dried spear grass. Leaving this, the ground, as far as the eye could reach, was strewed with the black, shining, well rounded pebbles. The Larrea even was scarcely seen, and dreariness seemed to mantle the earth. The arroyo by which we descended to the river was cut from a bed of reddish pebbles 20 or 30 feet deep, and as we neared the river they were soldered together in a conglomerate of which lime was the cement.

We saw to-day on the rocks, other rude carvings of the Indians, but their modern date was apparent.

To-day there was a dead calm, about meridian intensely hot, and the dust rose in volumes as our party advanced.

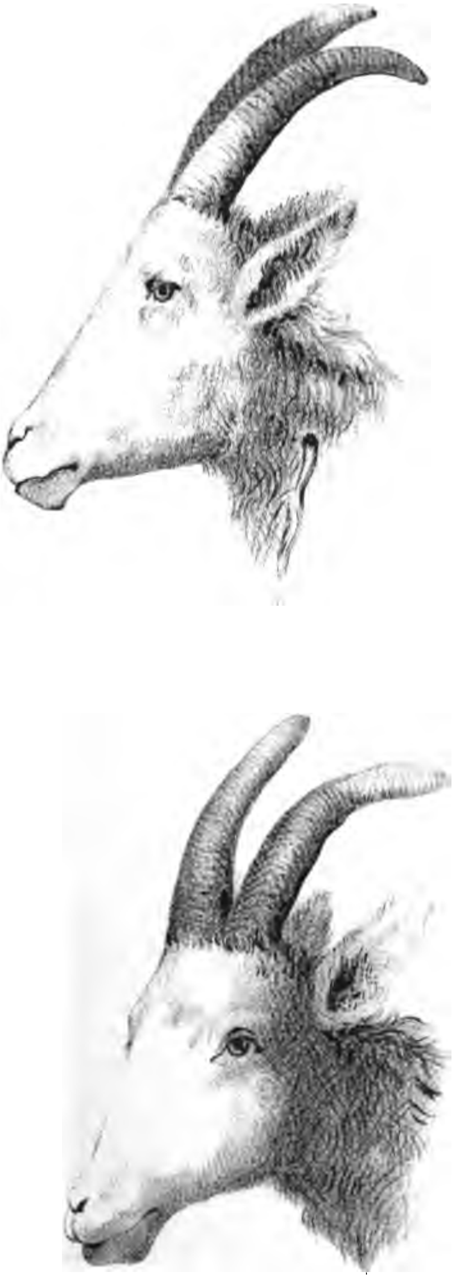
We found the river spread over a greater surface, about 100 yards wide, and flowing gently along over a sandy bottom, the banks fringed with cane, willow, and myrtle.

Last night I took an involuntary plunge into it, for my mule sunk in a quick sand, while I was searching for a place to cross my party. To-night I took a swim, but found the waters disagreeably cold.

The chain of broken hills still continued on the north side, and when near our camp of this date, circled in an amphitheatre, with its arch to the north. The basaltic columns, rising into the shape of spires, domes, and towers, gave it the appearance, as we approached, of a vast city on the hills. The distance of the crown of this amphitheatre, determined by angulation, is——miles, and Francisco informs me, that against its north base the Colorado strikes. So at this point, which is about six miles below our camp of this date, the Gila and Colorado must be near together. The hills and mountains appeared entirely destitute of vegetation, and on the plains could be seen, only at long intervals, a few stunted tufts of larrea Mexicana, and wild wormwood, artemisia cana.

November 19.—The table lands were the same as those described yesterday, but the valley widens gradually, and for most of the way is six or eight miles wide, and the soil excellent. Some remains of former settlements in broken pottery, corn grinders, &c.; but much fewer in number than above. Nine miles from camp a spur of mountains of an altered silicious sandstone came in from the southeast, sharp as the edge of a case knife, and shooting into pinnacles. At their base we passed for half a mile over the sharp edges of a red altered sandstone, dipping southwest about 80°, indeed nearly vertical.

On this spur was killed a mountain sheep, one of a large flock, from which we named it Goat's spur. We encamped on an island where the valley is contracted by sand buttes in what had been very recently the bed of the river. It was overgrown with willow, cane, Gila grass, flag grass, &c. The pools in the old bed of the river were full of ducks, and all night the swan, brant, and geese, were passing, but they were as shy as if they had received their tuition on the Chesapeake bay, where they are continually chased by sportsmen. The whole island was tremulous



HEAD OF THE MOUNTAIN GOAT FEMALE

Lith by E. Weber & Co. Ba

with the motion of the mules grazing, and my observations were, therefore, not very satisfactory.

11 circum-meridian altitudes of Procyon, and 12 altitudes of Polaris, give the latitude of the camp, 32° 43′ 38″.

November 20.—The table lands were of sand, and the bottom of the river constantly received deposites from them, which changed its bed frequently, as might be seen from the different growths of cotton wood marking the old land. Our road, about five miles from last night's camp, was traversed by a spur of coarse grained granite underlaid by old red sandstone dipping some 80° to the south and west. The direction of the spur was nearly parallel to those before noted, northwest and southeast, which is the direction of the axis of the maximum elevation of most of the mountains traversing the course of the Gila.

Our camp was pitched on a little patch of grass two miles from the river; night came on before the horses reached it, and they were without water for twenty-four hours; there was a pond near the camp, but so salt that the horses could not drink it.

At noon, the thermometer was 74°, at 6, p. m., 52°, and at 6 o'clock the next morning, 19°, which has been about the average range of temperature fer the last two weeks.

November 21.—To-day we marched only eight and a half miles, and halted for a patch of grama, which was an agreeable and beneficial change to our mules, which had been living on cane and willow for some days past.

The plains are now almost entirely of sand, and composed of sandy and calcareous loam with iron pyrites and common salt, covered sparsely with chamiza, Larrea Mexicana, and a shrubby species of sage.

I observed at night for latitude and time, and there being two occultations of Jupiter's satellites, I was tempted to observe them with our inferior telescope, which only gave us another proof of its uselessness for the purpose.

November 22.—Mr. Warner and I started before the advance sounded, and climbed the sharp spur of a continuous comb of mountains coming from the southeast, to try if we could see the Colorado of the west. The mountains rose abruptly from the plains as they mostly do in this region, resembling in appearance large dykes terminating at top in a sharp ridge which a man could, at any part, straddle. They were of hard granite, pepper and salt colored, traversed by seams of white quartz. This spur gives the river Gila quite a bend to the north, and from that point to its mouth, which we reached at night, the river is straight in its general direction; but its course is crooked and dotted with sandbars, by incursions from the sandhills which now flank both its sides. The sand is brought down by the winds from the valley of the Colorado. Its volume seemed, I think, a little diminished, probably absorbed by the sand.

The day was warm, the dust oppressive, and the march, twenty-two miles, very long for our jaded and ill-fed brutes. The general's horse gave out, and he was obliged to mount his mule.

Most of the men were on foot, and a small party, composed chiefly of the general and staff, were a long way ahead of the straggling column, when, as we approached the end of our day's journey, every man was straightened in his saddle by our suddenly falling on a camp which, from the trail, we estimated at 1,000 men who must have left that morning. Speculation was rife, but we all soon settled down to the opinion that it was General Castro and his troops; that he had succeeded in recruiting an army in Sonora, and was now on his return to California. Carson expressed the belief that he must be only ten miles below, at the crossing. Our force consisted only of 110 men. The general decided we were too few to be attacked, and must be the aggressive party, and if Castro's camp could be found, that he would attack it the moment night set in, and beat them before it was light enough to discover our force.

The position of our camp was decided, as usual, with reference to the grass. The lives of our animals were nearly as important as our own. It was pitched to-day in a little hollow encircled by a chain of sand hills, overgrown with mezquite.

The sergeant of the general's guard was behind, his mule having broken down; and when he came in reported having seen two Indians about five miles back. For a short time we supposed this immense trail was a band of Indians returning from a successful marauding expedition in Sonora or California; but this conjecture was soon dispelled by the appearance of a mounted Mexican on a sand butte overlooking our camp, who, after taking a deliberate survey, disappeared. The camp was arranged immediately for defence, and a cordon of sentinels stationed on the sand hills.

The two howitzers did not arrive till nine o'clock, and the officer in charge, Lieutenant Hammond, reported he had seen large fires to the right, apparently five miles distant, on the opposite side of the Gila.

The general said it was necessary for him to know who occupied the camp, its force, character, and destination.

He ordered me to take my party and fifteen dragoons, for the purpose of reconnoitring. After beating about in the mezquite for some time, we struck a slough of the Gila, where grew some tall willows. Up one of these I sent a dragoon, who saw no fire, but whose ears were gladdened by the neighing of hores. He slipped down the tree much faster than he climbed it, quite enchanted with the hope of exchanging his weary mule for a charger. Instead of reporting what he had seen, he exclaimed, "Yes, sir, there are enough for us all." "Did you see the fires?" "No! but they are all on horses; I heard them neighing, and they cover much ground." He pointed in the direction, and after proceeding a short distance, we all heard distinctly the noise of the horses, indicating a large number.

Silence was enjoined, and we proceeded stealthily along for some time, when a bright fire blazed before us. I halted the guard, and with two dragoons, Londeau and Martinez, proceeded unobserved until within a few feet of the fire. Before it stood an armed Mex-

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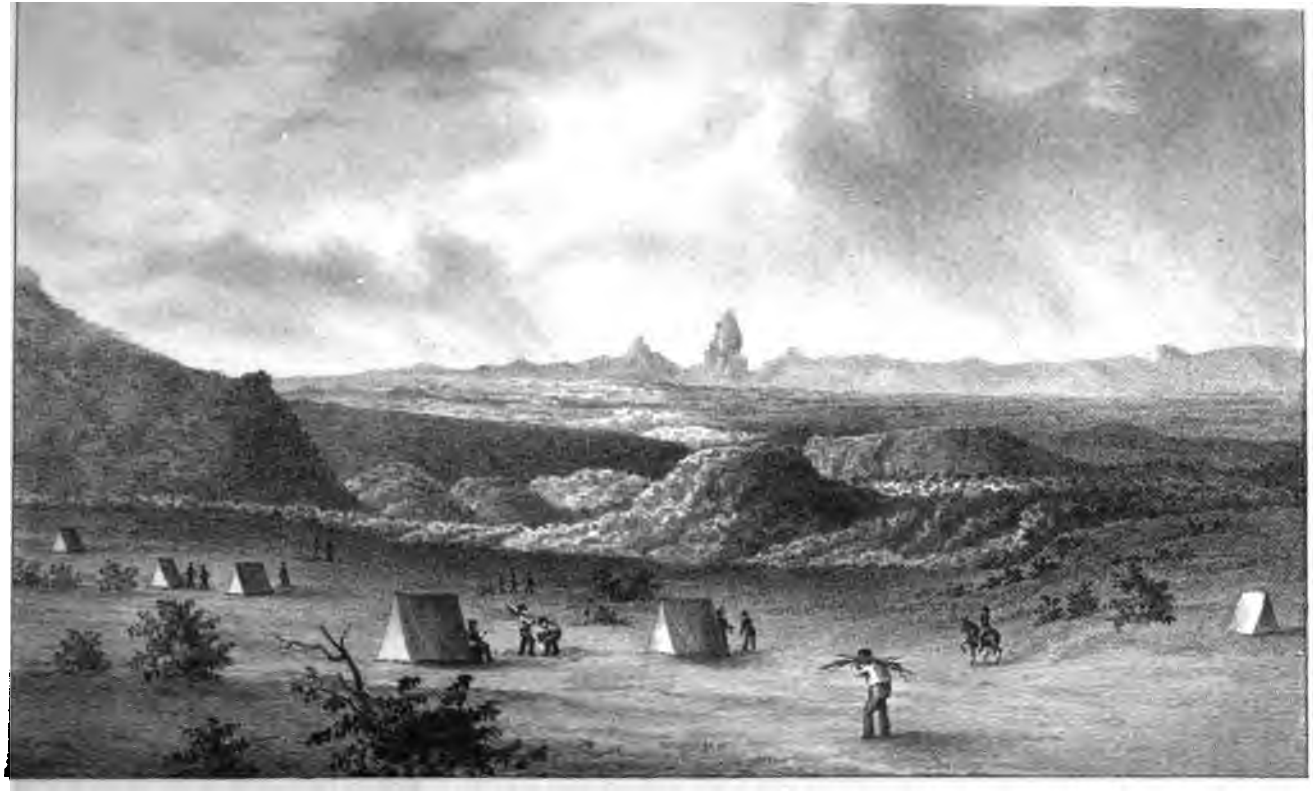


JUNCTION OF THE GILA & COLORADO RIVERS

Lith. by E. Weber & Co Balto.

ican. I sent Londeau and Martinez with orders to assume the occupation of trappers, and ascertain whom, and what, the man guarded. The conference was short; other Mexicans advanced, and I sent in man for man. It was not Castro as we expected, but a party of Mexicans with 500 horses from California, on their way to Sonora for the benefit of Castro.

I took the four principal men to the general, and left a guard to watch the camp and see that no attempt was made to escape. The men were examined separately, and each gave a different account of the ownership and destination of the horses.

The chief of the party, a tall venerable looking man, represented himself to be a poor employé of several rich men engaged in supplying the Sonora market with horses. We subsequently learned that he was no less a personage than Jose Maria Leguna, a colonel in the Mexican service.

November 23.—We did not move camp to day, in order to make a refit from last night's capture, and give our mules an opportunity to pick what little grass they could before taking the desert of 90 miles, which lies on the other side of the Colorado, and between us and water.

Warner, Stanly, and myself, saddled up to visit the junction of the Gila and Colorado, which we found due north from our camp, and about a mile and a half distant. The day was stormy, the wind blowing fiercely from the north. We mounted a butte of feldspathic granite, and, looking 25° east of north, the course of the Colorado was tracked by clouds of flying sand. The Gila comes into it nearly at right angles, and the point of junction, strangely chosen, is the hard butte through which, with their united forces they cut a cañon, and then flow off due magnetic west, in a direction the resultant due to the relative strength of the rivers.

The walls of the cañon are vertical and about 50 feet high, and 1,000 feet long. Almost before entering the cañon, in descending the Gila, its sea-green waters are lost in the chrome colored hue of the Colorado. For a distance of three or four miles below the junction, the river is perfectly straight, and about 600 feet wide; and up at least to this point, there is little doubt that the Colorado is always navigable for steamboats. Above, the Colorado is full of shifting sandbars, but is, no doubt, to a great extent susceptible of navigation.

The Gila, at certain stages, might be navigated up to the Pimos village, and possibly with small flat boats at all stages of water.

Near the junction, on the north side, are the remains of an old Spanish church, built near the beginning of the 17th century, by the renowned missionary, Father Kino. The mission was eventually sacked by the Indians, and the inhabitants all murdered or driven off. It will probably yet be the seat of a city of wealth and importance, most of the mineral and fur regions of a vast extent of country being drained by the two rivers. The stone butte through which they have cut their passage is not more than a mile in length. The Gila once flowed to the south, and the Colorado to the north of this butte, and the point of junction was below. What freak of nature united their efforts in forcing the butte, is difficult to say. During freshets, it is probable the rivers now discharge their surplus waters through these old channels. Francisco informs me that the Colorado, seven day's travel up from the butte, continues pretty much as we saw it.

There a cañon is reached, impassable for horses or canoes. The country between is settled by the Coyotaros, or wolf-eaters, cochineears, dirty fellows, Tontears, or fools, and the Garroteros, or club Indians. These cultivate melons, beans and maize.

On our return we met a Mexican, well mounted and muffled in his blanket. I asked him where he was going; he said to hunt horses. As he passed, I observed in each of his holsters the neck of a bottle, and on his croup a fresh made sack, with other evidences of a preparation for a journey. Much against his taste I invited him to follow me to camp; several times he begged me to let him go for a moment, that he would soon return. His anxiety to be released increased my determination not to comply with his request. I took him to General Kearney and explained to him the suspicious circumstances under which I had taken him, and that his capture would prove of some importance. He was immediately searched, and in his wallet was found the mail from California, which was of course opened.

Among the letters was one addressed to General Jose Castro, at Alta, one to Antonio Castro, and others to men of note in Sonora. All suspected of relating to public affairs were read, and we ascertained from them that a counter revolution had taken place in California, that the Americans were expelled from Santa Barbara, Puebla de los Angeles, and other places; and that Robideaux, the brother of our interpreter, who had been appointed alcalde by the Americans, was a prisoner in jail. They all spoke exultingly of having thrown off "the detestable Anglo-Yankee yoke," and congratulated themselves that the tri-color once more floated in California.

Captain Flores was named as the general and governor, pro tem., and the enthusiasm of the people described as overflowing in the cause of emancipation from the Yankee yoke. One letter gave a minute and detailed account of a victory stated to have been obtained over the Americans. It stated that 450 men landed at San Pedro, and were met, defeated, and driven back to the fort at San Pedro. This last was attributed by us to Mexican braggadocio, as it is usual with them to represent their defeats as victories; but that there was a disturbance of a serious kind in the province, we could not doubt, from the uniformity of the accounts on that head. We also learned that the horses captured were in part for General Castro. Nothing more was wanting to legitimize our capture, and Captain Moore was directed to remount his men.

The letters contained precise information, but being dated so far back as the 15th October, left us in great doubt as to the real state of affairs in California, and the Mexicans played their parts so dexterously, it was not in our power to extract the truth from them.

One of the party, who had received some little favor from Carson in California, was well plied with brandy, but all that could be extorted from him was the advice that we should not think of going to the Puebla with our small force, counsel that our friend soon learned we had not the slightest intention of following.

The position of our camp, about one mile and a half south of the junction of the Colorado and Gila rivers, determined by 12 circum-meridian altitudes of Sirius, 6 of Saturn, and 12 altitudes of Polaris, is latitude 32° 42′ 09″. The longitude by one set of lunar distances, E. and W., 114° 37′ 09″, which agrees with the chronometric determination of the same place, determined by assuming the longitude of San Diego to be 117° 11′.

The clouds, together with my military duties, interfered with taking a more elaborate set of lunar distances. An inspection of the individual observations for latitude will show that the latitude of the camp may be relied on, but I regret it was not in my power to measure the exact distance of our camp from the mouth of the Gila.

At night, passing my arm over the surface of the fur robe in which I was enveloped, electric sparks were discharged in such quantities as to make a very luminous appearance, and a noise like the rattle of a snake.

November 24.—We visited the camp of our Mexican friends, whom the general determined to release, and found there was a woman with the party in the agonies of childbirth. She was at once furnished from our stores with all the comforts we possessed. This poor creature had been dragged along, in her delicate situation, over a fearful desert.

The captured horses were all wild and but little adapted for immediate service, but there was rare sport in catching them, and we saw for the first time the lazo thrown with inimitable skill. It is a saying in Chihuahua that "a Californian can throw the lazo as well with his foot as a Mexican can with his hand," and the scene before us gave us an idea of its truth. There was a wild stallion of great beauty which defied the fleetest horse and the most expert rider. At length a boy of fourteen, a Californian, whose graceful riding was the constant subject of admiration, piqued by repeated failures, mounted a fresh horse, and, followed by an Indian, launched fiercely at the stallion.

His lariat darted from his hand with the force and precision of a rifle ball, and rested on the neck of the fugitive; the Indian, at the same moment, made a successful throw, but the stallion was too stout for both, and dashed off at full speed, with both ropes flying in the air like wings. The perfect representation of Pegasus, he took a sweep, and followed by his pursuers, came thundering down the dry bed of the river. The lazos were now trailing on the ground, and the gallant young Spaniard, taking advantage of the circumstance, stooped from his flying horse and caught one in his hand. It was the work of a moment to make it fast to the pommel of his saddle, and by a short turn of his own horse, he threw the stallion a complete somerset, and the game was secure.

We travelled over a sandy plain a few miles, and descended into the wide bed of the Colorado, overgrown thickly with mezquite, willow, and cotton;wood; after making about ten miles, we encamped abreast of the ford on a plateau covered with young willows, of which our horses were to lay in a sufficient supply to last them over the desert. Since writing the above, we have found a good patch of grass, and our people have been ordered to cut a ration for each mule to carry along.

The night was excessively cold and damp, and in the morning our blankets were covered with a little dew. For the first time, the bugle calls were distinctly reverberated, showing the atmospheric change as we approach the coast and descend into the neighborhood of the sea level. In New Mexico, even when surrounded by hills and perpendicular walls, the report of fire arms, and the sound of the bugle, were unattended by any distinct echo. The reports were sharp and unpleasant, not rounded, as here, by the reverberation.

The country, from the Arkansas to this point, more than 1,200 miles, in its adaptation to agriculture, has peculiarities which must forever stamp itself upon the population which inhabits it. All of North Mexico, embracing New Mexico, Chihuahua, Sonora, and the Californias, as far north as the Sacramento, are, as far as the best information goes, the same in the physical character of its surface, and differ but little in climate or products.

In no part of this vast tract can the rains from Heaven be relied upon, to any extent, for the cultivation of the soil. The earth is destitute of trees, and in great part also of any vegetation whatever.

A few feeble streams flow in different directions from the great mountains, which in many places traverse this region. These streams are separated, sometimes by plains, and sometimes by mountains, without water and without vegetation, and may be called deserts, so far as they perform any useful part in the sustenance of animal life.

The cultivation of the earth is therefore confined to those narrow strips of land which are within the level of the waters of the streams, and wherever practised in a community with any success, or to any extent, involves a degree of subordination, and absolute obedience to a chief, repugnant to the habits of our people.

The chief who directs the time and the quantity of the precious irrigating water must be implicitly obeyed by the whole community. A departure from his orders, by the waste of water, or unjust distribution of it, or neglect to make the proper embankments, may endanger the means of subsistence of many people. He must therefore be armed with power to punish promptly and immediately.

The profits of labor are too inadequate for the existence of negro slavery. Slavery, as practiced by the Mexicans, under the form of peonage, which enables their master to get the services of the adult while in the prime of life, without the obligation of rearing him in infancy, supporting him in old age, or maintaining his family, affords no data for estimating the profits of slave labor, as it exists in the United States.

No one who has ever visited this country, and who is acquainted with the character and value of slave labor in the United States, would ever think of bringing his own slaves here with any view to profit, much less would he purchase slaves for such a purpose. Their labor here, if they could be retained as slaves, among peons, nearly of their own color, would never repay the cost of transportation, much less the additional purchase money.

I made many inquiries as to the character of the vast region of country embraced in the triangle, formed by the Colorado of the west, the Del Norte, and the Gila; and the information collected, will, at some future time, be thrown into notes for the benefit of future explorers, but are not given in this work, as I profess to write only of what I saw.

From all that I learn, the country does not differ materially in its physical character from New Mexico, except, perhaps, being less denuded of soil and vegetation. The sources of the Salinas, the San Francisco, Azul, San Carlos, and Prieto, tributaries of the Gila, take their rise in it. About their head waters, and occasionally along their courses, are presented sections of land capable of irrigation.

The whole extent, except on the margin of streams, is said to be destitute of forest trees. The Apaches, a very numerous race, and the Navajoes, are the chief occupants, but there are many minor bands, who, unlike the Apaches and Navajoes, are not nomadic, but have fixed habitations. Amongst the most remarkable of these are the Soones, most of whom are said to be Albinos. The latter cultivate the soil, and live in peace with their more numerous and savage neighbors.

Departing from the ford of the Colorado in the direction of Sonora, there is a fearful desert to encounter. Alter, a small town, with a Mexican garrison, is the nearest settlement.

All accounts concur in representing the journey as one of extreme hardship, and even peril. The distance is not exactly known, but it is variously represented at from four to seven days' journey. Persons bound for Sonora from California, who do not mind a circuitous route, should ascend the Gila as far as the Pimos village, and thence penetrate the province by way of Tucson.

November 25.—At the ford, the Colorado is 1,500 feet wide, and flows at the rate of a mile and a half per hour. Its greatest depth in the channel, at the ford where we crossed, is four feet. The banks are low, not more than four feet high, and, judging from indications, sometimes, though not frequently, overflowed. Its general appearance at this point is much like that of the Arkansas, with its turbid waters and many shifting sand islands.

The ford is entered at the lower extremity of the plateau upon which we encamped, and leads down the river, crossing three sand islands, which we sketched, but as they are constantly shifting, the sketch will perhaps afford no guide to the traveller, and may even lead him into error. They are therefore not furnished. The ford is narrow and circuitous, and a few feet to the right or left sets a horse afloat. This happened to my own horse.

Report makes the distance of the mouth of the Colorado, from the crossing, eighty miles, but unless the river is very crooked, this cannot be; Lieut. Hardy, of the royal navy, determined the mouth to be in latitude 31° 51″ north, and longitude 114° 1′.

The growth on the river bottom is cotton-wood, willow of different kinds, equisetum hyemale, (scouring rush,) and a nutritious grass in small quantities.

After crossing, we ascended the river three quarters of a mile, where we encountered an immense sand drift, and from that point until we halted, the great highway between Sonora and California lies along the foot of this drift, which is continually but slowly encroaching down the valley. Prosopis glandulosa, wild sage, and ephedra compose the growth; the first is luxuriant.

We halted at a dry arroyo, a few feet to the left of the road leading into the Colorado, where there was a hole five or six feet deep, which by deepening furnished sufficient water for the men.

We are yet, by the indication of the barometer, but 20 or 30 feet above the river, and where the sands from the desert to the north have not encroached, the soil appears good. There are remains of zequias about five miles back, and where we halted, the remains of Indian settlements, but it is probable the water has been cut off by the drift, and cannot now be brought from the river above.

I made observations at night for time and latitude, and found the position of the place to be north latitude 32° 40′ 22″, and longitude 114° 56′ 28″, west of Greenwich.

We tied our animals to the mezquite trees, (Prosopis glandulosa,) and remarking on the way that they showed an inclination to eat the bean of this plant, we sent the men to collect them; the few gathered were eaten with avidity.

November 26.—The dawn of day found every man on horseback and a bunch of grass from the Colorado tied behind him on the cantle of his saddle. After getting well under way, the keen air at 26° Fahrenheit made it most comfortable to walk. We travelled four miles along the sand butte, in the same direction as yesterday, about south 75° west, (magnetic;) we mounted the buttes and found, after a short distance, a firmer footing covered with fragments of lava, rounded by water, and many agates. We were now fairly on the desert.

Our course now inclined a few degrees more to the north, and at 10, a. m., we found a large patch of grama, where we halted for an hour, and then pursued our way over the plains covered with fragments of lava, traversed at intervals by sand buttes, until 4, p. m., when, after travelling 24 miles, we reached the Alamo or cotton-wood. At this point, the captured Spaniards informed us, that failing to find water, they had gone a league to the west, in pursuit of their horses, where they found a running stream. We accordingly sent parties to search, but neither the water nor their trail could be found.

Neither was there any cotton-wood at the Alamo, as its name would signify; but Francisco said that it was nevertheless the place, the tree having probably been covered by the encroachments of the sand, which here terminates in a bluff 40 feet high, making the arc of a great circle convexing to the north.

Descending this bluff, we found in what had been the channel of a stream, now overgrown with a few ill-conditioned mezquite, a large hole where persons had evidently dug for water. It was necessary to halt to rest our animals, and the time was occupied in deepening this hole, which after a strong struggle, showed signs of water. An old champagne basket, used by one of the officers as a pannier, was lowered in the hole, to prevent the crumbling of the sand. After many efforts to keep out the caving sand, a basket-work of willow twigs effected the object, and much to the joy of all, the basket, which was now 15 or 20 feet below the surface, filled with water. The order was now given for each mess to draw a camp-kettle of water, and Captain Turner was placed in charge of the spring, to see fair distribution.

When the messes were supplied, the firmness of the banks gave hopes that the animals might be watered, and each party was notified to have their animals in waiting; the important business of watering then commenced, upon the success of which depended the possibility of their advancing with us a foot further.

Two buckets for each animal were allowed. At 10, a. m., when my turn came, Captain Moore had succeeded, by great exertions, in opening another well, and the one already opened began to flow more freely, in consequence of which, we could afford to give each animal as much as it could drink. The poor brutes, none of which had tasted water in forty-eight hours, and some not for the last sixty, clustered round the well and scrambled for precedence.

At 12 o'clock I had watered all my animals, thirty-seven in number, and turned over the well to Captain Moore.

The animals still had an aching void to fill, and all night was heard the munching of sticks, and their piteous cries for more congenial food.

November 27 *and* 28.—To-day we started a few minutes after sunrise. Our course was a winding one, to avoid the sand-drifts. The Mexicans had informed us that the waters of the salt lake, some thirty or forty miles distant, were too salt to use, but other information led us to think the intelligence was wrong. We accordingly tried to reach it; about 3, p. m., we disengaged ourselves from the sand and went due (magnetic) west, over an immense level of clay detritus, hard and smooth as a bowling green.

The desert was almost destitute of vegetation, now and then an Ephedra, Œnothera, or bunches of Aristida were seen, and occasionally the level was covered with a growth of Obione canescens, and a low bush with small oval plaited leaves, unknown.

The heavy sand had proved too much for many horses and some mules, and all the efforts of their drivers could bring them no farther than the middle of this dreary desert. About 8 o'clock, as we approached the lake, the stench of dead animals confirmed the reports of the Mexicans and put to flight all hopes of our being able to use the water.

The basin of the lake, as well as I could judge at night, is about three-quarters of a mile long and half a mile wide. The water had receded to a pool, diminished to one half its size, and the approach to it was through a thich soapy quagmire. It was wholly unfit for man or brute, and we studiously kept the latter from it, thinking that the use of it would but aggravate their thirst.

One or two of the men came in late, and, rushing to the lake, threw themselves down and took many swallows before discovering their mistake; but the effect was not injurious except that it increased their thirst.

At the point where we left the sand, sketches were taken of the objects by which our pilot wended his way; these may serve to guide future travellers. From this point the traveller may go directly to the gap exhibited in the sketch, nearly magnetic west, through which the trail passes.

A few mezquite trees and a chenopodiaceous shrub bordered the lake, and on these our mules munched till they had sufficiently refreshed themselves, when the call to saddle was sounded, and we groped silently our way in the dark. The stoutest animals now began to stagger, and when day dawned, scarcely a man was seen mounted.

With the sun rose a heavy fog from the southwest, no doubt from the gulf, and, sweeping towards us, enveloped us for two or three hours, wetting our blankets and giving relief to the animals. Before it had dispersed we came to a patch of sun-burned grass.

When the fog had entirely dispersed we found ourselves entering a gap in the mountains, which had been before us for four days. The plain was crossed, but we had not yet found water. The first valley we reached was dry, and it was not till 12 o'clock, m., that we struck the Cariso (cane) creek, within half a mile of one of its sources, and although so close to the source, the sands had already absorbed much of its water, and left but little running. A mile or two below, the creek entirely disappears.

We halted, having made fifty-four miles in the two days, at the source, a magnificent spring, twenty or thirty feet in diameter, highly impregnated with sulphur, and medicinal in its properties. No vessel could be procured to bring home some of the water for analysis, but I scraped a handful of the salt which had effloresced to the surface of the adjacent ground, and Professor Frazer finds it to contain sulphate of lime, and magnesia, and chloride of sodium.

The spring consisted of a series of smaller springs, or veins, varying in temperature from 68° to 75°. This variation, however, may have been owing to the different exposures of the fountains in which the thermometer was immersed. The growth was cane, rush, and a coarse grass, such as is found on the marshes near the sea shore.

The desert over which we had passed, ninety miles from water to water, is an immense triangular plain, bounded on one side by the Colorado, on the west by the Cordilleras of California, the coast chain of mountains which now encircles us, extending from the Sacramento river to the southern extremity of Lower California, and on the northeast by a chain of mountains, a continuation of the same spur noted on the 22d as running southeast and northwest. It is chiefly covered with floating sand, the surface of which in various places is white with diminutive spiñelas, and everywhere over the whole surface is found the large and soft muscle shell.

I have noted the only two patches of grass found during the "jornada." There were scattered, at wide intervals, the Palafoxia linearis, Atriplex, Encelia farinosa, Daleas, Euphorbias, and a Simsia, described by Dr. Torrey as a new species.

The southern termination of this desert is bounded by the Tecaté chain of mountains and the Colorado; but its northern and eastern boundaries are undefined, and I should suppose from the accounts of trappers, and others, who have attempted the passage from California to the Gila by a more northern route, that it extends many days' travel beyond the chain of barren mountains which bound the horizon in that direction.

The portal to the mountains through which we passed was formed by immense buttes of yellow clay and sand, with large flakes of mica and seams of gypsum. Nothing could be more forlorn and desolate in appearance. The gypsum had given some consistency to the sand buttes, which were washed into fantastic figures. One ridge formed apparently a complete circle, giving it the appearance of a crater; and although some miles to the left, I should have gone to visit it, supposing it to be a crater, but my mule was sinking with thirst, and water was yet at some distance. Many animals were left on the road to die of thirst and hunger, in spite of the generous efforts of the men to bring them to the spring. More than one was brought up, by one man tugging at the halter and another pushing up the brute, by placing his shoulder against its buttocks. Our most serious loss, perhaps, was that of one or two fat mares and colts brought with us for food; for before leaving camp, Major Swords found in a concealed place one of the best pack mules slaughtered, and the choice bits cut from his shoulders and flanks, stealthily done by some mess less provident than others.

I observed at night for time and latitnde; for longitude by measuring 18 distances between the ☾ and Aldebaran, and the ☾ and Fomalhaut.

Latitude 32° 52′ 33″. Longitude 116° 06′ 09″.

November 29.—The grass at the spring was anything but desirable for our horses, and there was scarcely a ration left for the men. This last consideration would not prevent our giving the horses a day's rest wherever grass could be found. We followed the dry sandy bed of the Cariso nearly all day, at a snail's pace, and at length reached the "little pools" where the grass was luxuriant but very salt. The water strongly resembled that at the head of the Cariso creek, and the earth, which was very tremulous for many acres about the pools, was covered with salt.

This valley is at no point more than half a mile wide, and on each side are mountains of grey granite and pure quartz, rising from 1,000 to 3,000 feet above it.

A few miles from the spring called Ojo Grande, at the head of the creek, several scattered objects were seen projected against the cliffs, hailed by the Florida campaigners, some of whom were along, as old friends. They were cabbage trees, and marked the locale of a spring and a small patch of grass. We found also to-day, in full bloom, the Fouquiera spinosa, a rare and beautiful plant; the Plantago, new to our flora; a new species of Eriogonum, very remarkable for its extremely numerous long hair-like fruit stalks and minute flowers.

We rode for miles through thickets of the centennial plant, Agavé Americana, and found one in full bloom. The sharp thorns terminating every leaf of this plant were a great annoyance to our dismounted and wearied men whose legs were now almost bare. A number of these plants were cut by the soldiers, and the body of them used as food. The day was intensely hot, and the sand deep; the animals, inflated with water and rushes, gave way by scores; and, although we advanced only sixteen miles, many did not arrive at camp until 10 o'clock at night. It was a feast day for the wolves, which followed in packs close on our track, seizing our deserted brutes and making the air resound with their howls as they battled for the carcasses.

The water comes to the surface in pools at this place. It is a valley surrounded by high bleak mountains destitute of vegetation. The mountains are of a micaceous granite seamed with volcanic matter. The grass, which is coarse, extends for a mile or two along the valley.

A heavy cloud overhung the mountains to the west, and the wind blew a hurricane from that quarter; yet our zenith was never obscured, except for a minute at a time by a fleeting cloud detached from the great bank. A horse was killed for food, which was eaten with great appetite, and all of it consumed.

November 30.—Notwithstanding the water was saltish and in pools, and the grass unfavorable to the horses, yet we were compelled to avail ourselves of it for a day to recruit. The day and night were very unpleasant, from the high wind which came over the snow clad mountains to the west. The ground, too, was tremulous, and my observation for time, by which I hoped to obtain the rate of my chronometers, were not such as I could desire.

December 1.—We ascended the valley, now destitute of both grass and water, to its termination, and then descended to the deserted Indian village of San Felippe. The mountains on either side are lofty, I suppose from 3,000 to 5,000 feet high, and those to the west encrusted on the top with snow and icicles. Our camp was in a long field of grass, three or four miles in extent, through which a warm stream flowed and drained through a cañon to the north, abreast of the village. We went to the barren hills and collected the dry sage and scrub mezquite, with which we made a feeble fire. The Larrea Mexicana grew here also, but it is unfit for fuel.

About nine miles from the camp, we passed the summit which is said to divide the waters flowing into the Colorado from those flowing into the Pacific, but I think it is a mistake. The pass is much below the peaks on either side, and the height gives no indication of the elevation of the range, and, indeed, the barometric reading was but an indifferent index of the height of the pass, as the day was stormy. We are still to look for the glowing pictures drawn of California. As yet, barrenness and desolation hold their reign. We longed to stumble upon the rancherias, with their flocks of fat sheep and cattle. Meat of horses, may be very palatable when fat, but ours are poor and tough, and it is hard to satisfy the cravings of hunger with such indifferent food.

Early in the day's march, we met two Indians, a man and woman; they could give us no information of what was passing on the western side of the mountains. They continued on with the utmost indifference, exhibiting no signs of fear or astonishment at this sudden apparition of ragged blue-coats. They had fine athletic figures, but were prematurely wrinkled from poverty and exposure to cold.

December 2 *and* 3.—We commenced to ascend another "divide," and as we approached the summit the narrow valley leading to it was covered with timber and long grass. On both sides, the evergreen oak grew luxuriantly, and, for the first time since leaving the States, we saw what would even there be called large trees. Emerging from these, we saw in the distance the beautiful valley of the Aqua Caliente, waving with yellow grass, where we expected to find the rancheria owned by an American named Warner.

As we passed, crows and wolves were seen in numbers.

Leaving the valley, we ascended the hills to the north covered with mezquite, estafiat; &c. Our progress was slow and painful; we thought Warner's rancheria never would open on our eager sight, when suddenly it burst upon our view at the foot of the hill. We were mistaken for Indians, and soon were seen horsemen at full speed driving off cattle and horses to the mountains. We quickened our pace to arrest this proceeding. The rancheria was in charge of a young fellow from New Hampshire, named Marshall. We ascertained from him that his employer was a prisoner to the Americans in San Diego, that the Mexicans were still in possession of the whole of the country except that port, San Francisco, and Monterey; that we were near the heart of the enemy's stronghold, whence he drew his supplies of men, cattle and horses, and that we were now in possession of the great pass to Sonora, by which he expected to retreat, if defeated, to send his prisoners if successful, and to communicate with Mexico.

To appease hunger, however, was the first consideration. Seven of my men eat, at one single meal, a fat full grown sheep. Our camp was pitched on the road to the Pueblo, leading a little north of west. To the south, down the valley of the Aqua Caliente, lay the road to San Diego. Above us was Mr. Warner's backwoods, American looking house, built of adobe and covered with a thatched roof. Around, were the thatched huts of the more than half naked Indians, who are held in a sort of serfdom by the master of the rancheria. I visited one or two of these huts, and found the inmates living in great poverty. The thermometer was at 30°, they had no fires, and no coverings but sheepskins. They told me; that when they were under the charge of the missions they were all comfortable and happy, but since the good priests had been removed, and the missions placed in the hands of the people of the country, they had been ill treated. This change took place in 1836, and many of the missions passed into the hands of men and their connexions who had effected the change.

Near the house is the source of the Aqua Caliente, a magnificent hot spring, of the temperature of 137° Fahrenheit, discharging from the fissure of a granite rock a large volume of water, which, for a long distance down, charges the air with the fumes of sulphuretted hydrogen. Above it, and draining down the same valley, is a cold spring of the temperature of 45°, and without the aid of any mechanical instrument, the cold and warm water may be commingled to suit the temperature of the bather.

The Indians have made pools for bathing. They huddle around the basin of the spring to catch the genial warmth of its vapors, and in cold nights immerse themselves in the pools to keep warm. A day will come, no doubt, when the invalid and pleasure seeking portion of the white race, will assemble here to drink and bathe in these waters, ramble over the hills which surround it on all sides, and sit under the shade of the great live oaks that grow in the valley.

Our information in reference to the state of affairs in California was yet very imperfect and unsatisfactory. Marshall spoke of a Mr. Stokes, an Englishman, who lived fifteen miles distant, on the road to San Diego. The general at once despatched Marshall to him, and in three hours he appeared in our camp, presenting a very singular and striking appearance. His dress was a black velvet English hunting coat, a pair of black velvet trowsers, cut off at the knee and open on the outside to the hip, beneath which were drawers of spotless white; his leggins were of black buck-skin, and his heels armed with spurs six inches long. Above the whole bloomed the broad merry face of Mr. Stokes, the Englishman. He was very frank, proclaimed himself a neutral, but gave us all the information he possessed; which was, that Commodore Stockton was in possession of San Diego, and that all the country between that place and Santa Barbara was in possession of the "country people." He confirmed all that Marshall had said, and stated he was going to San Diego the next morning. The general gave him a letter for that place.

I made observations at night for time and latitude, but the flying clouds, and the trembling ground on which we were encamped, made it a delicate operation.

Information was received on the 2d, that fifteen miles distant, on the road to the Pueblo, a band of horses and mules were cached, belonging to General Flores and others. Tired as our people were, nightfall found twenty-five of them in the saddle, with fresh horses, under the command of Lieut. Davidson, accompanied by Carson, on their way in pursuit of the cache. Davidson was successful, and returned with the horses on the 3d, about meridian; but the animals, like those we captured at the mouth of the Gila, were mostly unbroken, and not of much service.

My observations give for the latitude of our camp of this date, which was on the meadow to the south of the rancheria, 33° 16″ 57′.

We remained in camp on the 3d to rest.

December 4.—The morning was murky, and we did not start till 9 o'clock, about which time it commenced to rain heavily, and the rain lasted all day. Our route was chiefly through narrow valleys overtopped by high hills of some fertility, covered with oaks. We were now in the region of rains, and the vegetation, though not luxuriant, was very much changed, but it was too late in the fall to get the flowers or fruits to determine the plants.

Our camp was pitched, after marching 13½ miles, in the valley of the Rio Isabel, near the rancheria of Mr. Stokes, formerly the mission of Saint Isabel.

Mr. S. had gone, but he left his keys with a man whom the Spaniards called Signor Beel, with directions to entertain us. The Signor was a deserter from an English merchant-man, and had lived in the neighboring mountains some ten years; during this time he had acquired a little property, and some knowledge of Spanish, but the sailor was visible in all his acts. Before night Mr. Beel had made good use of his keys, and shone in his true colors as sailor Bill.

We were drenched to the skin, and looked forward with some pleasure to the idea of once more entering a house, with a blazing fire and plenty to eat and drink. In the last two items we were entirely satisfied, but sadly disappointed in finding no fire, the only chimney about the rancheria being in the kitchen.

The dragoons took the dinner intended for the officers, and we were obliged to stand, cracking our heels in the cold damp chapel, now converted into a hall, for two hours, before the Signor, or rather Sailor Bill, could cook another dinner.

The appearance of desolation which the rancheria presents is little calculated to impress us with favorable notions of the agricultural resources of this part of California. The land in the narrow valleys is good, but surrounded every where by high barren mountains, and where the land is good, the seasons are too dry for men to attempt cultivation without facilities for irrigation.

December 5.—A cold rainy day, and the naked Indians of the rancheria gathered around our fires. We marched from the rancheria of San Isabel to that of Santa Maria. On the way we met Capt. Gillespie, Lieut. Beale, and Midshipman Duncan of the navy, with a party of thirty-five men, sent from San Diego with a despatch to Gen. Kearny. We arrived at the rancheria after dark, where we heard that the enemy was in force nine miles distant, and not finding any grass about the rancheria, we pushed on and encamped in a cañon two miles below. It was long after night when we halted, and though there may have been plenty of grass, we could not find it. Besides the rain, a heavy fog obscured the landscape, and little could be seen of the country during the day's journeying; what we did see, however, did not impress us favorably as to its fertility.

Although this was the rainy season, no flowing streams were crossed after leaving the San Isabel, and the ground was destitute of grass. Our camp was in a valley, overgrown with large oak trees and other shrubbery; but it was too dark to distinguish their character.

A party under Lieut. Hammond was sent to reconnoitre the enemy, reported to be near at hand. By some accident the party was discovered, and the enemy placed on the qui vive. We were now on the main road to San Diego, all the "by-ways" being in our rear, and it was therefore deemed necessary to attack the enemy, and force a passage. About 2 o'clock, a. m., the call to horse was sounded.

December 6.—We marched nine miles before day-break over a hilly country, leaving our packs to come on in the rear. The general invited Mr. Warner and myself to ride with him, and taking four of my party, I left Messrs. Bestor and Stanly with the rest, six in number, to take care of the baggage, and look after the instruments and notes.

When within a mile of the enemy, whose force was not known to us, his fires shone brightly. The general and his party were in advance, preceded only by the advanced guard of twelve men under Captain Johnston. He ordered a trot, then a charge, and soon we found ourselves engaged in a hand to hand conflict with a largely superior force.

For an account of this engagement, reference may be made to the official report of the general, which has been published. The subjoined topographical sketch will show the first and second position of the enemy, and his final rout. As day dawned, the smoke cleared away, and we commenced collecting our dead and wounded. We found 18 of our officers and men were killed on the field, and 13 wounded.

Amongst the killed were Captains Moore and Johnston, and Lieutenant Hammond of the 1st dragoons.

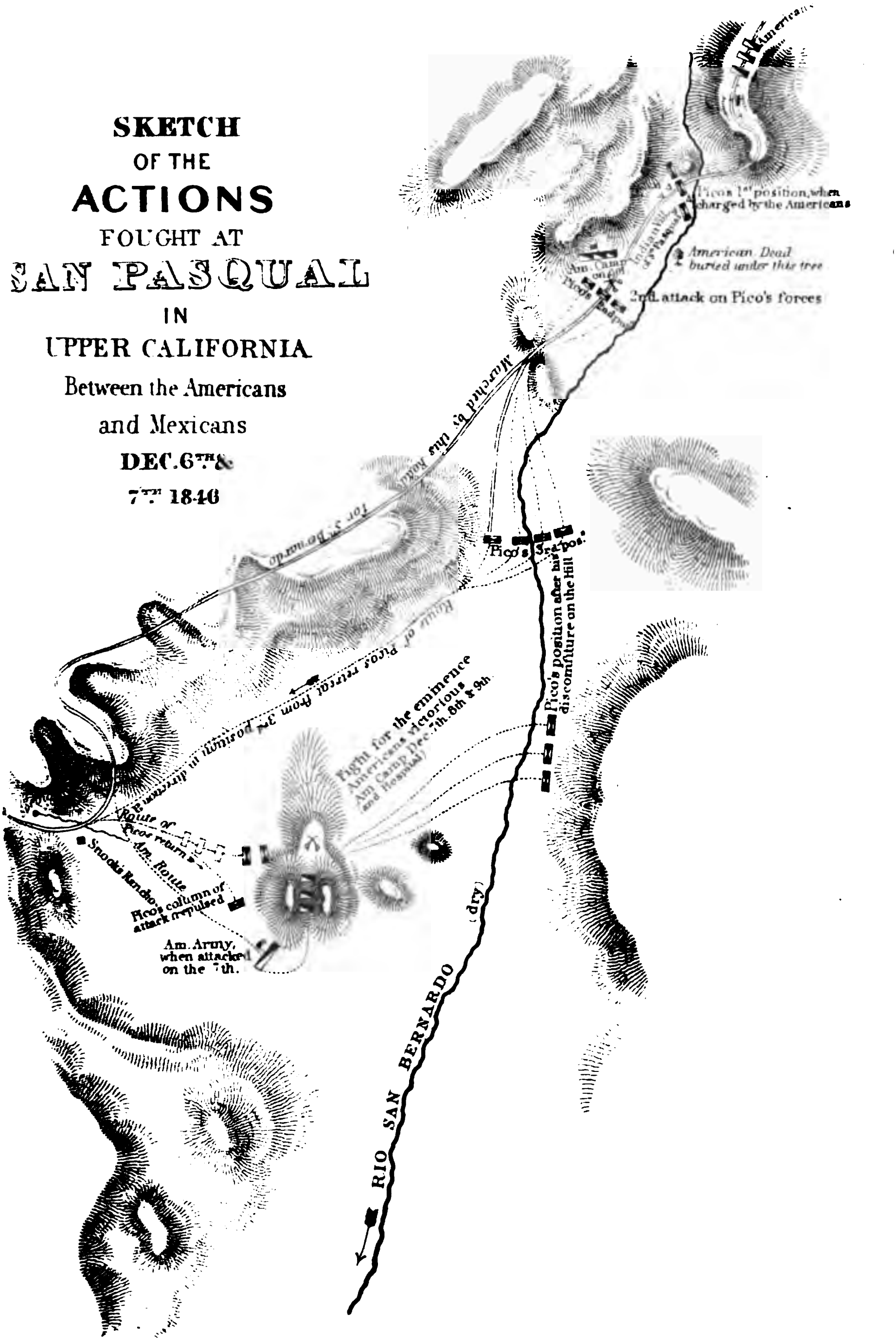
The general, Capt. Gillespie, Capt. Gibson, Lieut. Warner, and Mr. Robideau badly wounded.

A large body of horsemen were seen in our rear, and fears were entertained lest Major Swords and the baggage should fall into their hands. The general directed me to take a party of men and go back for Major Swords and his party. We met at the foot of the first hill, a mile in rear of the enemy's first position. Returning, I scoured the village to look for the dead and wounded. The first object which met my eye was the manly figure of Capt Johnston. He was perfectly lifeless, a ball having passed directly through the centre of his head.

The work of plundering the dead had already commenced; his watch was gone, nothing being left of it but a fragment of the gold chain by which it was suspended from his neck. By my directions Sergeant Falls and four men took charge of the body and carried it into camp. Captain Johnston and one dragoon were the only

SKETCH
OF THE
ACTIONS
FOUGHT AT
SAN PASQUAL
IN
UPPER CALIFORNIA

Between the Americans
and Mexicans
DEC. 6TH & 7TH 1846


Americans
Pico's 1st position, when charged by the Americans
American Dead buried under this tree
2nd attack on Pico's forces
Am. Camp on 6th
Indian Vill. of St Pasqual
Pico's 2nd pos.
Marched by this Road for St Bernardo
Pico's 3rd pos.
Pico's position after his discomfiture on the Hill
Route of Pico's retreat from 3rd position in direction
Fight for the eminence
Americans victorious
Am Camp Dec 7th. 8th & 9th
and Hospital)
Route of Pico's return
Am. Route
Snook's Rancho
Pico's column of attack repulsed
Am. Army, when attacked on the 7th.
RIO SAN BERNARDO
(dry)

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FOUNDATIONS.

persons either killed or wounded on our side in the fight by fire-arms.

Information was received that the dead, no matter where buried, would be dug up to rob the bodies of their clothes, and orders were given to pack them on mules, with the intention of carrying them to San Diego, but it was found that there were not a sufficient number of strong animals left to convey both the dead and the wounded and directions were given therefore to inter them at night as secretly as possible.

When night closed in, the bodies of the dead were buried under a willow to the east of our camp, with no other accompaniment than the howling of myriads of wolves, attracted by the smell. Thus were put to rest together, and forever, a band of brave and heroic men. The long march of 2,000 miles had brought our little command, both officers and men, to know each other well. Community of hardships, dangers, and privations, had produced relations of mutual regard which caused their loss to sink deeply in our memories.

The general's wounds were so serious, that during the day Captain Turner assumed command and directed operations. There was but one surgeon in our party, Dr. Griffin, and notwithstanding his great skill and assiduity, he did not finish dressing the wounded till late in the afternoon, nor were the ambulances for their transportation completed. This, with the desire to bury our dead under cover of night, caused the forward movement to be postponed till morning.

Our provisions were exhausted, our horses dead, our mules on their last legs, and our men, now reduced to one third of their number, were ragged, worn down by fatigue, and emaciated. The officers of Captain Gillespie's party said there were wheel carriages at San Diego, 39 miles distant, and it was determined to send there for the means of conveying our wounded. Early in the day, Godey, with a few picked men, was on his way by a circuitous route to that place.

Our position was defensible, but the ground, covered with rocks and cacti, made it difficult to get a smooth place to rest, even for the wounded. The night was cold and damp, and notwithstanding our excessive fatigues of the day and night previous, sleep was impossible.

December 7.—Day dawned on the most tattered and ill-fed detachment of men that ever the United States mustered under her colors. The enemy's pickets and a portion of his force were seen in front. The sick, by the indefatigable exertions of Dr. Griffin, were doing well, and the general enabled to mount his horse. The order to march was given, and we moved off to offer the enemy battle, accompanied by our wounded, and the whole of our packs. The ambulances grated on the ground, and the sufferings of the wounded were very distressing. We had made for them the most comfortable conveyance we could, and such as it was, we were indebted principally to the ingenuity of the three remaining mountain men of the party, Peterson, Londeau, and Perrot. The fourth, the brave François Ménard, had lost his life in the fight of the day before. The general resumed the command, placing Captain Turner, of the dragoons, in command of the remnant of dragoons, which were consolidated into one company.

Arranging our wounded and the packs in the centre, we marched towards San Diego in the direction of the San Barnardo rancheria, taking the right hand road over the hills, and leaving the river San Barnardo to the left. The enemy retired as we advanced. When we arrived at the rancheria of San Barnardo, we watered our horses and killed chickens for the sick. The rancheria was the property of Mr. Snooks, an Englishman; it was deserted except by a few Indians.

Finding no grass about the rancheria, we moved on towards the bed of the river, driving many cattle before us. We had scarcely left the house and proceeded more than a mile, when a cloud of cavalry debouched from the hills in our rear, and a portion of them dashed at full speed to occupy a hill by which we must pass, while the remainder threatened our rear. Thirty or forty of them got possession of the hill, and it was necessary to drive them from it. This was accomplished by a small party of six or eight, upon whom the Californians delivered their fire; and strange to say, not one of our men fell. The capture of the hill was then but the work of a moment, and when we reached the crest, the Californians had mounted their horses and were in full flight. We did not lose a man in the skirmish, but they had several badly wounded. By this movement we lost our cattle, and were convinced that if we attempted any further progress with the ambulances we must lose our sick and our packs. It was impossible to move in the open field with these encumbrances, against an enemy more than twice our number, and all superbly mounted. The general, therefore, determined to halt for the night, to have the wounds of the sick redressed, and then to cut our way to San Diego.

December 8.—We bored holes for water, and killed the fattest of our mules for meat. In the morning a flag of truce was sent into our camp, informing us that Andres Pico, the commander of the Mexican forces, had just captured four Americans, and wished to exchange them for a like number of Californians. We had but one to exchange, and with this fellow I was sent to meet Andres Pico, whom I found to be a gentlemanly looking and rather handsome man.

The conversation was short; for I saw the man he wished to exchange was Burgess, one of those sent on the morning of the 6th to San Diego, and we were very anxious to know the result of his mission. Taking rather a contemptuous leave of his late captors, he informed us of the safe arrival of himself and Godey at San Diego. He also stated that when captured, his party, consisting of himself and two others, on their return from San Diego, had previously "cached" their letters under a tree, which he pointed out; but on subsequent examination, we found the letters had been abstracted.

Our wounded were still in no condition to move; to have attempted to transport them would have required one half of our fighting force, and it was decided most expedient to wait until they could be carried on horseback. At night, Lieutenant Beale, of the navy, Mr. Carson, and an Indian, volunteered to go to San Diego, 29 miles distant—an expedition of some peril, as the enemy now occupied all the passes to that town.

The observations made to night give for the latitude of this camp, 33° 03′ 42″, and the longitude 117° 03′ 29″.

Don Antonio Robideaux, a thin man of fifty-five years, slept next to me. The loss of blood from his wounds, added to the coldness of the night, 28° Farenheit, made me think he would never see daylight, but I was mistaken. He woke me to ask if I did not smell coffee, and expressed the belief that a cup of that beverage would save his life, and that nothing else would. Not knowing there had been any coffee in camp for many days, I supposed a dream had carried him back to the cafés of St. Louis and New Orleans, and it was with some surprise I fonud my cook heating a cup of coffee over a small fire made of wild sage. One of the most agreeable little offices performed in my life, and I believe in the cook's, to whom the coffee belonged, was, to pour this precious draught into the waning body of our friend Robideaux. His warmth returned, and with it hopes of life. In gratitude he gave me, what was then a great rarity, the half of a cake made of brown flour, almost black with dirt, and which had, for greater security, been hidden in the clothes of his Mexican servant, a man who scorned ablutions. I eat more than half without inspection, when, on breaking a piece, the bodies of several of the most loathesome insects were exposed to my view. My hunger, however, overcame my fastidiousness, and the morceau did not appear particularly disgusting till after our arrival at San Diego, when several hearty meals had taken off the keenness of my appetite, and suffered my taste to be more delicate.

Last night the brave Sergeant Cox died of his wounds, and was buried to-day deep in the ground, and covered with heavy stones, to prevent the wolves from tearing him up. This was a gallant fellow, who had, just before leaving Fort Leavenworth, married a pretty wife.

December 10.—The enemy attacked our camp, driving before them a band of wild horses, with which they hoped to produce a stampede. Our men behaved with admirable coolness, turning off the wild animals dexterously. Two or three of the fattest were killed in the charge, and formed, in the shape of a gravy-soup, an agreeable substitute for the poor steaks of our worn down brutes, on which we had been feeding for a number of days.

Doctor Griffin gave the welcome information that all the sick, but two, were able to get in the saddle, and orders were given to march the next morning.

There was little expectation that Carson and Lieutenant Beale would succeed in reaching San Diego; the hiding place pointed out by Burgess was examined, and the letters from San Diego were not found.

We were all reposing quietly, but not sleeping, waiting for the break of day, when we were to go down and give the enemy another defeat. One of the men, in the part of the camp assigned to my defence, reported that he heard a man speaking in English. In a few minutes we heard the tramp of a column, followed by the hail of the sentinel. It was a detachment of 100 tars and 80 marines under Lieutenant Gray, sent to meet us by Commodore Stockton, from whom we learned that Lieutenant Beale, Carson, and the Indian had arrived safely at San Diego. The detachment left San Diego on the night of the 9, cached themselves during the day of the 10th, and joined us on the night of that day. These gallant fellows busied themselves till day distributing their provisions and clothes to our naked and hungry people.

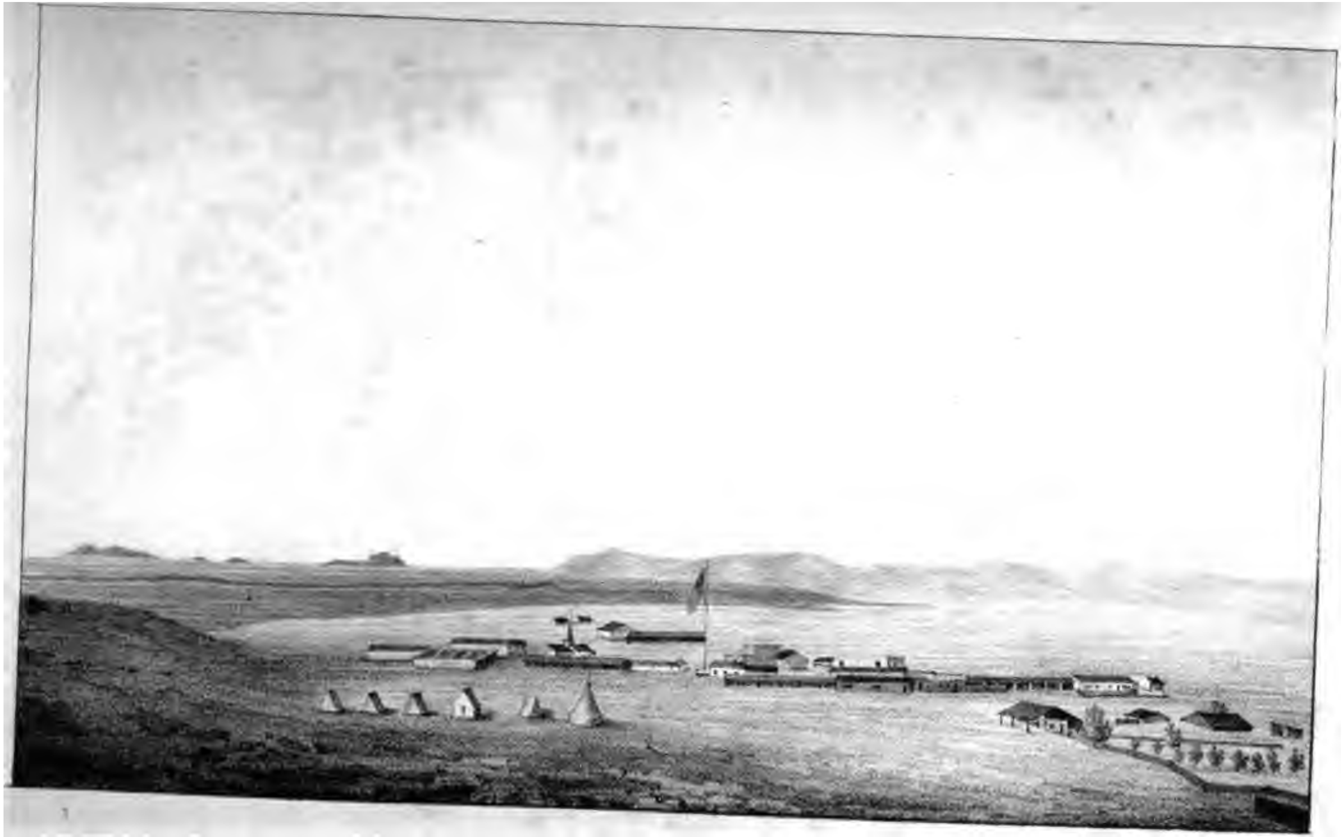
December 11.—The junction of our forces was a complete surprise to the enemy, and when the sun rose but a small squadron of horse was to be seen at Stokes's rancheria. They had fled precipitately leaving most of the cattle behind them, for which we had been contending for the last three days. None of our men were mounted—theirs were all mounted; and why they should have left their stock is inconceivable. It was certainly not incompatible with their safety to have carried them all away. The only way of accounting for it is, by supposing our night attack had filled them with the unnecessary fear of being surprised. We drove the cattle before us.

Our march was in close order, over a road leading through a rolling country of light black soil, destitute of trees, and without water, covered with oats indigenous to the soil, now fallen to decay. The grass in protected places was sprouting, but not in sufficient quantity to afford grazing to our stock. After marching twelve miles we arrived at the rancheria of Signor Alvarado, a person who was in the fight against us. The women and children had fled to the mountains, leaving plenty of turkies, chickens, goats and sheep behind; also two casks of wine, the produce of the country. The havoc committed on the comestibles was immense; the sheep not killed were driven by us into San Diego. The owner had taken the oath of allegiance to the United States and broken it.

The navy took a prisoner at this house as they marched to meet us. He gave us much information, and was then liberated. He stated that Pico's force consisted of 160 men, 100 of which were drawn from the Pueblo, and the balance from the surrounding country. We subsequently received authentic accounts that his number was 180 men engaged in the fight, and that 100 additional men were sent him from the Pueblo, who reached his camp on the 7th.

There was a fine spring at this rancheria, and another two miles below it.

On the hill, before reaching the rancheria, the Pacific opened for the first time to our view, the sight producing strange but agreeable emotions. One of the mountain men who had never seen the ocean



SAN DIEGO

before, opened his arms and exclaimed: "Lord! there is a great prairie without a tree."

December 12.—We followed the Solidad through a deep fertile valley in the shape of a cross. Here we ascended to the left a steep hill to the table lands, which, keeping for a few miles, we descended into a waterless valley, leading into False Bay at a point distant two or three miles from San Diego. At this place we were in view of the fort overlooking the town of San Diego and the barren waste which surrounds it.

The town consists of a few adobe houses, two or three of which only have plank floors. It is situated at the foot of a high hill on a sand flat, two miles wide, reaching from the head of San Diego bay to False bay. A high promontory, of nearly the same width, runs into the sea four or five miles, and is connected by the flat with the main land. The road to the hide houses leads on the east side of this promontory, and abreast of them the frigate Congress and the sloop Portsmouth are at anchor. The hide houses are a collection of store houses where the hides of cattle are packed before being shipped; this article forming the only trade of the little town.

The bay is a narrow arm of the sea indenting the land some four or five miles, easily defended, and having twenty feet of water at the lowest tide. The rise is said to be five feet, making the greatest water twenty-five feet.

Standing on the hill which overlooks the town, and looking to the northeast, I saw the mission of San Diego, a fine large building now deserted. The Rio San Diego runs under ground in a direct course from the mission to the town, and sweeping around the hill, discharges itself into the bay. Its original debouche was into False bay, where, meeting the waters rolling in from the seaward, a bar was formed by the deposite of sand, making the entrance of False bay impracticable.

Well grounded fears are entertained that the immense quantity of sand discharged by this river will materially injure, if it does not destroy the harbor of San Diego; but this evil could be arrested at a slight cost, compared with the objects to be obtained. At present San Diego is, all things considered, perhaps one of the best harbors on the coast from Callao to Puget's Sound, with a single exception, that of San Francisco. In the opinion of some intelligent navy officers, it is preferable even to this. The harbor of San Francisco has more water, but that of San Diego has a more uniform climate, better anchorage, and perfect security from winds in any direction. However, the commercial metropolis must be at San Francisco, owing to the greater extent and superiority of the country adjacent, watered by the rivers Sacramento and San Joachim, unless indeed San Diego should be made the terminus of a railroad leading by the route of the Gila to the Del Norte, and thence to the Mississippi and the Atlantic.

The rain fell in torrents as we entered the town, and it was my singular fate here, as in Santa Fé, to be quartered in the calaboose, a miserable hut, of one room, some 40 × 30 feet square. A huge old gun was mounted in this hovel, looking through an embrasure to the westward. In this building I was told that I could stow my party and my instruments safely.

We preferred the open air and the muddy plaza, saturated with all sorts of filth, to this wretched hole; but having no alternative, our chronometers and instruments were stowed in it and guarded by the indefatigable Mr. Bestor. I went off to accept from the hospitality of a friend the first bed I had seen in many months. About midnight there was one of those false alarms which ever and anon disturbed this goodly town. Four burly fellows rushed to man this gun, but they found themselves unexpectedly opposed by Mr. Bestor and two or three of my party. But for this timely resistance, my whole little stock of chronometers, barometer, &c., would have been totally destroyed. In the morning, through the kind exertions of my friend, Captain Gillespie, I was enabled to get a house with two rooms, the only unoccupied quarters in the town. Foreseeing employment of a different nature, my little party occupied themselves busily in collecting and bringing up the notes of our field-work.

On the 28th December I received notification from General Kearny to leave my party in San Diego and report to him for duty, as the acting adjutant general of the forces; Captain Turner, his adjutant general, having been assigned by him to the command of the remnant of the company of the 1st dragoons.

Lt. Warner was still too unwell, from the wounds received at San Pasqual, to accompany us, or to commence the survey of San Diego bay. Wishing to have a secure place to deposite my instruments, notes, &c., I applied to Captain Dupont to give them a place on board the Cyane. He granted this request and kindly insisted that Mr. Bestor and Mr. Stanly should also go on board, where they could pursue their work unmolested.

I should be very ungrateful if I did not here make my acknowledgments to Captain Dupont, and all the officers of the navy with whom we were thrown in contact, for the uniform kindness and the generous hospitality with which they always supplied our personal wants, and the promptness with which they rendered assistance in any public enterprise.

My work as topographical engineer may be considered to end at this place; and that portion of the map embraced between San Diego and the Pueblo or Ciudad de los Angeles is compiled from existing maps, with slight alterations made by myself from a view of the ground, without the aid of instruments.

The coast is taken from old Spanish charts, published in Madrid in 1825, kindly furnished me by Captain Wilkes. The harbor of San Diego has been surveyed by Captain Sir Edward Belcher, of the royal navy, whose determination of the longitude of the spit to the south of Punta Loma, published in his "voyage round the world," has been adopted, in the absence of time or instruments to enable me to make the requisite observations.

The longitude of the same point by Malispina 117° 17′, and the chronometric longitude brought by myself from my last station over the mountains, where lunar distances were observed, 117° 14′; but I have not hesitated to take the results of Sir Edward Belcher, although I have had no opportunity of seeing his observations.

Malispina's observations were made long since, and the results from the chronometers brought overland by me are liable to objections: first, from the imperfection in the determination of my intermediate stations by lunar distances, and, next, from the disturbances to which the chronometers were subjected in the battle of the 6th December, and the skirmish of the 7th, but more particularly the last, where a sudden charge was made in an open plain on our baggage by the enemy's cavalry.

The harbor was originally explored by Sebastian Vizcaino in 1603, but no settlement was made at San Diego until 1769.

Vessels may ride at anchor in the harbor, perfectly land-locked, but in very heavy southerly gales some inconvenience may be felt by those not provided with good ground tackle, from the immense volumes of kelp driven into the harbor.

The kelp (fucus giganteus) occupies a space in front of the harbor some miles in length and half a mile wide. At a distance, I took the kelp for a low island, but was informed of my error by Captain Schenck, who told me vessels were forced through it in a stiff breeze.

On the morning of the 29th December we marched out of San Diego with the following force:

	Capt.	Lieut.	Sergt.	Corpl.	Bug.	Privates.
Dragoons...............	1	1	2	4	2	47
Sailors acting artillery..	1	1	2	4	-	39
Sailors and marines acting infantry..........	8	10	17	17	-	345
Volunteers.............	3	3	6	-	-	48

Three employées of the topographical engineers, three medical officers, and twenty-five men, Indians, and Californians; the whole divided into four divisions or battalions, commanded by Lieutenant Rowan, Captain Turner, Lieutenant Renshaw, Lieutenant Zielin, and Captain Gillespie.

Six pieces of artillery, of various calibre, got up with great exertion, under the orders of Commodore Stockton, by Lieutenant Tilghman of the navy, acting as captain of artillery.

A wagon train, consisting of one four-wheel carriage and ten ox carts, under the charge of Lieutenant Minor of the navy. The wagons were heavily laden, and our progress was slow in the extreme. We did not reach the Solidad, the first watering place, till 8 o'clock at night.

I was ordered to ride forward and lay out a defensive camp, hoping to give confidence to the sailors, many of whom were now, for the first time, transferred to a new element.

We soon found their habits of discipline aboard ship made the transition easy, and I speedily arrived at the conclusion that Jack, properly handled, made a very good infantry soldier.

The plan of the camp being approved, I was directed to make it the habitual order of encamping wherever the configuration of the ground would admit. The plan was the natural one to protect ourselves from the night attacks of the enemy, who were all mounted. The mode in which they designed to make their night attacks was to drive into our camp a "manada" of wild mares, and then take advantage of the confusion they might create to deliver a charge.

December 30.—We encamped at the rancheria of Alvear.

December 31.—We encamped at the San Barnardo, having gone in three days only 30 miles. The ground passed over was the same as that described in the last two days of our march into San Diego.

January 1.—To-day we obtained some fresh oxen and a few fresh horses, which enabled us to do better and make 17 miles before sunset. Our road to-day diverged from that heretofore described, and laid over a rolling country, destitute of water and trees. Cattle were seen, in small numbers, covering the plains in all directions, proving to us that the enemy had found it impracticable to fulfil their boast, that we should not get a hoof from the day we left San Diego.

We pitched our camp at the Indian settlement of Buena Vista, passing by the way a deserted rancheria, where there was a puddle of stagnant water, the only water on the route.

January 2.—Six and a half miles march brought us to the deserted mission of San Luis Rey. The keys of this mission were in charge of the alcalde of the Indian village, a mile distant. He was at the door to receive us and deliver up possession.

There we halted for the day to let the sailors, who suffered dreadfully from sore feet, recruit a little.

This building is one which, for magnitude, convenience, and durability of architecture, would do honor to any country.

The walls are adobe, and the roofs of well made tile. It was built about sixty years since by the Indians of the country, under the guidance of a zealous priest. At that time the Indians were very numerous, and under the absolute sway of the missionaries. These missionaries at one time bid fair to christianize the Indians of California. Under grants from the Mexican government, they collected them into missions, built immense houses, and commenced successfully to till the soil by the hands of the Indians for the benefit of the Indians.

The habits of the priests, and the avarice of the military rulers of the territory, however, soon converted these missions into instruments of oppression and slavery of the Indian race.

The revolution of 1836 saw the downfall of the priests, and most of these missions passed by fraud into the hands of private individuals, and with them the Indians were transferred as serfs of the land.

This race, which, in our country, has never been reduced to slavery, is in that degraded condition throughout California, and do the only labor performed in the country. Nothing can exceed their present degraded condition.

For negligence or refusal to work, the lash is freely applied, and in many instances life has been taken by the Californians without being held accountable by the laws of the land.

This mission of San Luis Rey was, until the invasion of California by the Americans, in 1846, considered as public property. Just before that event took place, a sale was made of it for a small consideration, by the Mexican authorities, to some of their own people, who felt their power passing away, and wished to turn an *honest penny* whilst their power was left; but this sale was undoubtedly fraudulent, and will, I trust, not be acknowledged by the American government. Many other missions have been transferred in the same way; and the new government of California must be very pure in its administration to avoid the temptations which these fictitious sales, made by the retiring Mexican authorities, offer for accumulating large fortunes at the expense of the government.

The lands belonging to this mission are extensive, well watered, and very fertile. It is said, and I believe it probable from appearances, that wheat will grow in the valleys adjacent, without irrigation.

January 3.—After marching a few miles the wide Pacific opened to our view. We passed the St. Marguerita rancheria, once a dependency of San Luis Rey, now in the possession of the Pico family. We encamped near Flores, a deserted mission. Just below it, and near the ocean, is an Indian village. Cattle were seen in great numbers to-day, and several well broken pairs of oxen were picked up on the way.

Distance 10.5 miles.

January 4.—After leaving Flores a few miles, the high broken ground projects close in upon the sea, leaving but a narrow, uneven banquette, along which the road wends through a growth of chapparal.

Here we met three persons, bearing a flag of truce; one an Englishman, named Workman, another Fluge, a German; the third a Californian.

They brought a letter from Flores, who signed himself governor and captain general of the department of California, proposing to suspend hostilities in California, and leave the battle to be fought elsewhere between the United States and Mexico, upon which was to depend the fate of California. There was a great deal of other matter in the letter, useless to repeat. The commission returned with a peremptory refusal of the proposition of the governor and Captain General Flores.

After going nine miles from Flores, the high land impinges so close upon the sea that the road lies along the sea beach for a distance of eight miles. Fortunately for us the tide was out, and we had the advantage of a hard, smooth road. Notwithstanding this, our column stretched out a great distance, and we were compelled to make frequent halts for the rear to come up.

This pass presents a formidable military obstacle, and, in the hands of an intrepid and skilful enemy, we could have been severely checked, if not beaten back from it; but we passed unmolested, and encamped late at night on an open plain at the mouth of the stream leading from the mission of San Juan de Capristano, and about two miles from the mission.

It was so dark I could not see to lay off the lines of the camp accurately, and I was glad, in the morning, that an early start gave no time for criticism. Distance 18.8 miles.

January 5.—The mission of San Juan has passed into the hands of the Pico family. The cathedral was once a fine strong building, with an arched cupola; only one-half of the building, capped by a segment of the cupola, is now standing, the other part having been thrown down by an earthquake in the year 1822, killing some thirty or forty persons who had fled to it for refuge?

Attracted by a house having a brush fence round the door, as if to keep out intruders, I was told there were four men within, in the agonies of death, from wounds received at the battle of San Pasqual.

We moved to the Alisos rancheria, where we found a spring of good water, but nothing to eat. Through the kindness of Mr. Foster, an Englishman, we received here a supply of fresh horses.

The road was principally through the valley of the stream watering the mission. On each side were beautiful rounded hills, covered with a delicate tinge of green from the grass, which was now sprouting freely near the sea coast.

Up to this point, except a small patch at Flores, I had not seen the mark of a plough or any other instrument of husbandry. The rancherias were entirely supported by rearing cattle and horses. Distance 11.1 miles.

January 6.—To-day we made a long march of 19 miles to the upper Santa Anna, a town situated on the river of the same name. We were now near the enemy, and the town gave evidence of it. Not a soul was to be seen; the few persons remaining in it were old women, who, on our approach, had bolted their doors. The leaders of the Californians, as a means of inciting their people to arms, made them believe we would plunder their houses and violate their women.

Taking advantage of a deep ditch for one face of the camp, it was laid off in a very defensible position between the town and the river, expecting the men would have an undisturbed night's rest, to be in the morning ready for the fight, which might now be expected daily. In this hope we were mistaken. The wind blew a hurricane, (something very unusual in this part of California,) and the atmosphere was filled with particles of fine dust, so that one could not see and but with difficulty breathe.

January 7.—The wind continued to blow violently, which the enemy should have taken advantage of to attack us. Our weapons were chiefly fire-arms; his, the lance; and I was quite certain that in such a gale of wind as then blew, the difficulty of loading our arms would have proved a serious matter.

The Santa Anna is a fine dashing stream, knee-deep, and about 100 yards wide, flowing over a sandy bed. In its valley are many valuable vineyards and corn fields. It is capable of affording water to a great many more. On its banks are considerable tracts of uncultivated land within the level of irrigation. We now began to think there would be more formidable and united resistance by the enemy, and such was the unanimity of the men, women and children, in support of the war, that not a particle of information could be obtained in reference to his force or position.

After travelling ten miles we came to the Coyotes, a rancheria owned by a rich widow lady, who had just married a handsome young fellow, who might well pass for her son. These people we found at home, and we learned from them that the enemy intended to give us battle the next day. Indeed, as we approached the rancheria, several horsemen drew off, reconnoitring us so closely as to make it doubtful if they were not some of our own vaqueros.

January 8.—We passed over a country destitute of wood and water, undulating and gently dipping towards the ocean, which was in view. About two o'clock we came in sight of the San Gabriel river. Small squads of horsemen began to show themselves on either flank, and it became quite apparent the enemy intended to dispute the passage of the river.

Our progress was necessarily very slow, our oxen being poor, and our wagons (the ox-carts of the country) with wheels only about two feet in diameter.

The enemy did not yet discover his order of battle, and we moved to the river in our habitual order of march, when near the enemy, viz: the 2d division in front, and the 1st and 3d on the right and left flanks respectively; the guard and a company of volunteer carbiniers in the rear; our cattle and the wagon train in the centre, making for them, what the sailors wittily termed a Yankee "*corral*.", The artillery were distributed on the four angles of the rectangle.

This order of march was adopted from the character of the enemy's force, all of which was mounted; and in a measure from our own being men unaccustomed to field evolutions, it was necessary to keep them habitually in the order to resist cavalry attacks when in view of the enemy. We had no cavalry, and the object of the enemy was to deprive us of our cattle by sudden charges.

The river was about 100 yards wide, knee-deep, and flowing over quicksand. Either side was fringed with a thick undergrowth. The approach on our side was level; that on the enemy's was favorable to him. A bank fifty feet high, ranged parallel with the river, at point blank cannon distance, upon which he posted his artillery.

As we neared the thicket, we received the scattering fire of the enemy's sharp-shooters. At the same moment, we saw him place four pieces of artillery on the hill, so as to command the passage. A squadron of 250 cavalry just showed their heads above the hill, to the right of the battery, and the same number were seen to occupy a position on the left.

The 2d battalion was ordered to deploy as skirmishers, and cross the river. As the line was about the middle of the river, the enemy opened his battery, and made the water fly with grape and round shot. Our artillery was now ordered to cross—it was unlimbered, pulled over by the men, and placed in counter battery on the enemy's side of the river. Our people, very brisk in firing, made the fire of the enemy wild and uncertain. Under this cover, the wagons and cattle were forced with great labor across the river, the bottom of which was quick sand.

Whilst this was going on, our rear was attacked by a very bold charge, and repulsed.

On the right bank of the river there was a natural banquette, breast high. Under this the line was deployed. To this accident of the ground is to be attributed the little loss we sustained from the enemy's artillery, which showered grape and round shot over our heads. In an hour and twenty minutes our baggage train had all crossed, the artillery of the enemy was silenced, and a charge made on the hill.

Half-way between the hill and river, the enemy made a furious charge on our left flank. At the same moment, our right was threatened. The 1st and 2d battalions were thrown into squares, and after firing one or two rounds, drove off the enemy. The right wing was ordered to form a square, but seeing the enemy hesitate, the order was countermanded; the 1st battalion, which formed the right, was directed to rush for the hill, supposing that would be the contested point, but great was our surprise to find it abandoned.

The enemy pitched his camp on the hills in view, but when morning came, he was gone. We had no means of pursuit, and scarcely the power of locomotion, such was the wretched condition of our wagon train. The latter it was still deemed necessary to drag along for the purpose of feeding the garrison, intended to be left in the Ciudad de los Angeles, the report being that the enemy intended, if we reached that town, to burn and destroy every article of food. Distance 9.3 miles.

January 9.—The grass was very short and young, and our cattle were not much recruited by the night's rest; we commenced our march leisurely, at 9 o'clock, over the "Mesa," a wide plain between the Rio San Gabriel and the Rio San Fernando.

Scattering horsemen, and small reconnoitring parties, hung on our flanks. After marching five or six miles, we saw the enemy's line on our right, above the crest made by a deep indentation in the plain.

Here Flores addressed his men, and called on them to make one more charge; expressed his confidence in their ability to break our line; said that "yesterday he had been deceived in supposing that he was fighting soldiers."

We inclined a little to the left to avoid giving Flores the advantage of the ground to post his artillery; in other respects we continued our march on the Pueblo as if he were not in view.

When we were abreast of him, he opened his artillery at a long distance, and we continued our march without halting, except for a moment, to put a wounded man in the cart; and once to exchange a wounded mule, hitched to one of the guns.

As we advanced, Flores deployed his force, making a horse shoe in our front, and opened his nine-pounders on our right flank, and two smaller pieces on our front. The shot from the nine-pounders

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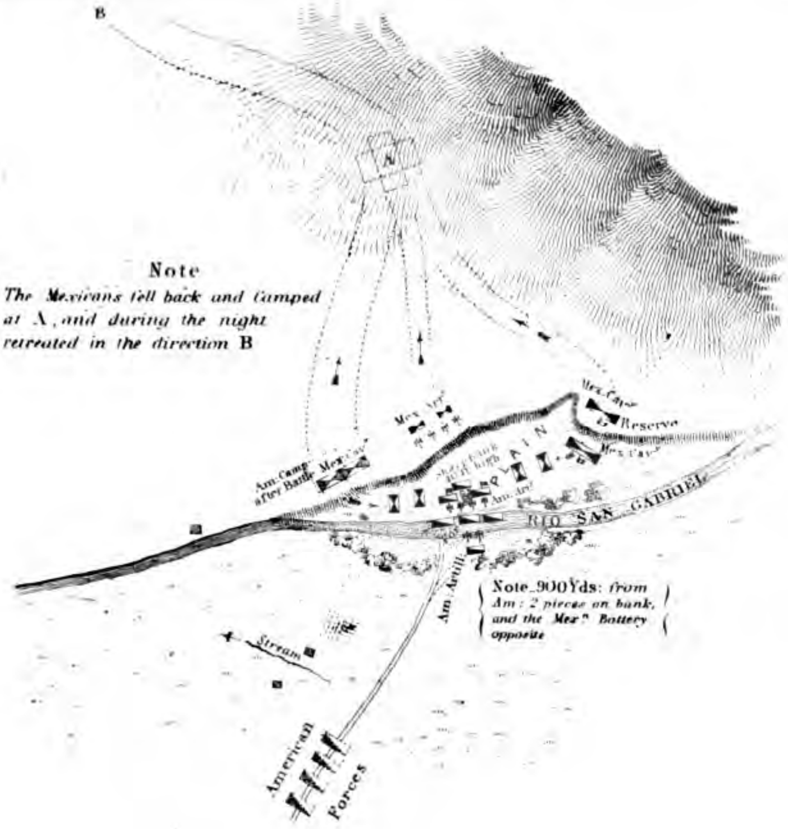
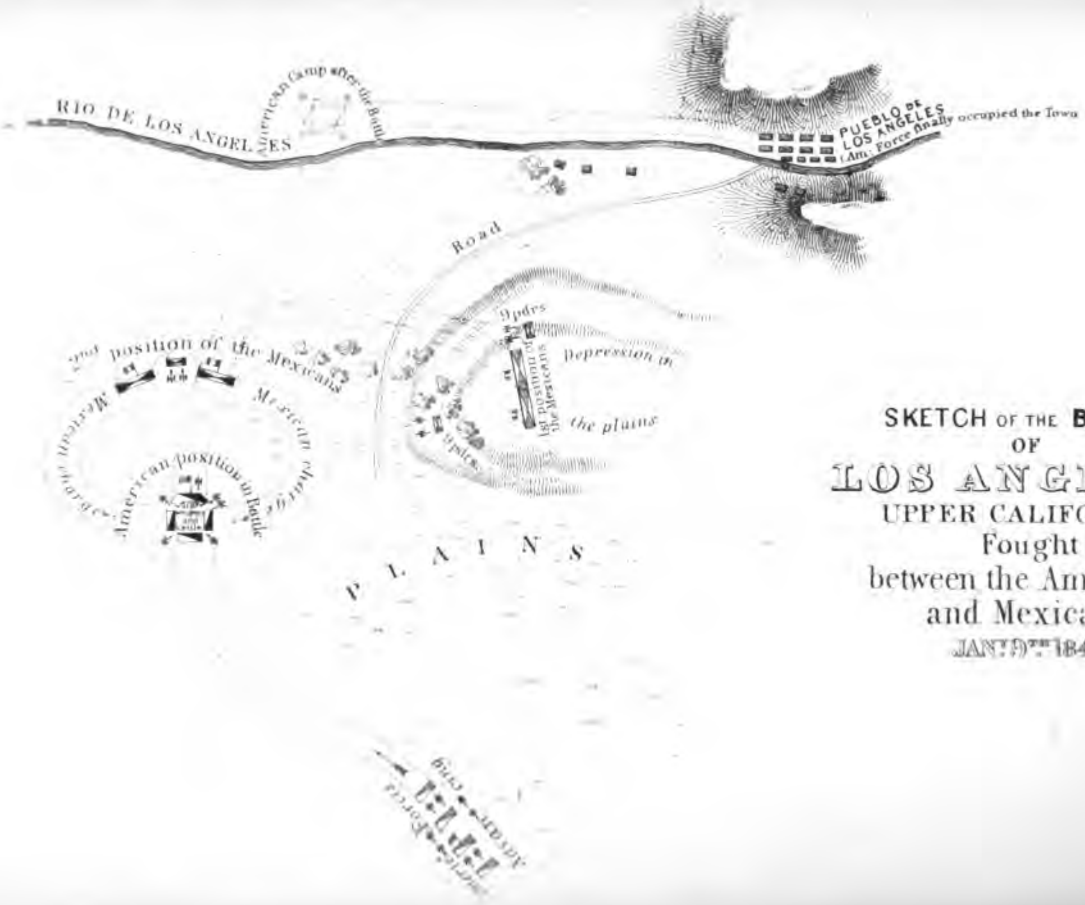


Note
The Mexicans fell back and Camped at A, and during the night retreated in the direction B

Note_900 Yds: *from Am: 2 pieces on bank, and the Mex.n Battery opposite*

SKETCH of the PASSAGE
OF THE
RIO SAN GABRIEL
UPPER CALIFORNIA
by the
Americans, _discomfiting
the opposing Mexican Forces
JANUARY 8TH. 1847.


RIO DE LOS ANGELES
American Camp after the Battle
PUEBLO DE LOS ANGELES
(Am: Force finally occupied the Town
Road
9 pdrs
1st position of the Mexicans
Depression in the plains
9 pdrs.
2nd position of the Mexicans
Mexican charge
Mexican charge
American position in Battle
P L A I N S
Forces
Advancing

SKETCH OF THE BATTLE
OF
LOS ANGELES
UPPER CALIFORNIA.
Fought
between the Americans
and Mexicans
JAN.Y 9TH 1847.

on our flank was so annoying that we halted to silence them. In about fifteen minutes this was done, and the order "forward" again given, when the enemy came down on our left flank in a scattering sort of charge; and notwithstanding the efforts of our officers to make their men hold their fire, they, as is usually the case under similar circumstances, delivered it whilst the Californians were yet about a hundred yards distant. This fire knocked many out of their saddles and checked them. A round of grape was then fired upon them, and they scattered. A charge was made simultaneously with this on our rear with about the same success. We all considered this as the beginning of the fight but it was the end of it. The Californians, the most expert horsemen in the world, stripped the dead horses on the field, without dismounting, and carried off most of their saddles, bridles, and all their dead and wounded on horseback to the hills to the right.

It was now about three o'clock, and the town, known to contain great quantities of wine and aguardiente, was four miles distant. From previous experience of the difficulty of controlling men when entering towns, it was determined to cross the river San Fernando, halt there for the night, and enter the town in the morning with the whole day before us. The distance to-day, 6.2 miles.

After we had pitched our camp, the enemy came down from the hills and 400 horsemen, with the four pieces of artillery, drew off towards the town, in order and regularity, whilst about sixty made a movement down the river, on our rear and left flank. This led us to suppose they were not yet whipped, as we thought, and that we should have a night attack.

January 10.—Just as we had raised our camp, a flag of truce, borne by Mr. Celis, a Castilian, Mr. Workman, an Englishman, and Alvarado, the owner of the rancheria at the Alisos, was brought into camp. They proposed, on behalf of the Californians, to surrender their dear City of the Angels, provided we would respect property and persons. This was agreed to; but not altogether trusting to the honesty of General Flores, who had once broken his parole, we moved into the town in the same order we should have done if expecting an attack.

It was a wise precaution, for the streets were full of desperate and drunken fellows, who brandished their arms and saluted us with every term of reproach. The crest, overlooking the town, in rifle range was covered with horsemen, engaged in the same hospitable manner. One of them had on a dragoon's coat, stolen from the dead body of one of our soldiers after we had buried him at San Pasqual.

Our men marched steadily on, until crossing the ravine leading into the public square, when a fight took place amongst the Californians on the hill; one became disarmed, and to avoid death rolled down the hill towards us, his adversary pursuing and lancing him in the most cold-blooded manner. The man tumbling down the hill was supposed to be one of our vaqueros, and the cry of "rescue him" was raised. The crew of the Cyane, nearest the scene, at once, and without any orders, halted and gave the man that was lancing him a volley; strange to say, he did not fall. Almost at the same instant, but a little before it, the Californians from the hill did fire on the vaqueros. The rifles were then ordered to clear the hill, which a single fire effected, killing two of the enemy. We were now in possession of the town; great silence and mystery was observed by the Californians in regard to Flores; but we were given to understand that he had gone to fight the force from the north, drive them back, and then starve us out of the town. Towards the close of the day we learned very certainly that Flores, with 150 men, chiefly Sonorians and desperadoes of the country had fled to Sonora, taking with him four or five hundred of the best horses and mules in the country, the property of his own friends. The silence of the Californians was now changed into deep and bitter curses upon Flores.

Some slight disorder took place among our men at night, from the facility of getting wine, but the vigilance of the officers soon suppressed it.

January 11.—It rained in torrents all day. I was ordered to select a site, and place a fort, capable of containing a hundred men; with this in view, a rapid reconnoissance of the town was made, and the plan of a fort sketched, so placed as to enable a small garrison to command the town and the principal avenues to it. The plan was approved. Many men came in during the day and surrendered themselves.

January 12.—I laid off the work, and, before night, broke the first ground. The population of the town, and its dependencies, is about 3,000; that of the town itself, about 1,500. It is the centre of wealth and population of the Mexico Californian people, and has heretofore been the seat of government. Close under the base of the mountains, commanding the passes to Sonora, cut off from the north by the pass at San Barbara, it is the centre of the military power of the Californians. Here all the revolutions have had their origin, and it is the point upon which any Mexican force from Sonora would be directed. It was therefore desirable to establish a fort, which, in case of trouble, should enable a small garrison to hold out till aid might come from San Diego, San Francisco, or Monterey, places which are destined to become centres of American settlements.*

January 13.—It rained steadily all day, and nothing was done on the work; at night I worked on the details of the fort.

Thursday 14.—We drank to-day the wine of the country, manufactured by Don Luis Vigne, a Frenchman. It was truly delicious resembling more the best description of Hock than any other wine Many bottles were drunk leaving no headache or acidity on the stomach. We obtained, from the same gentleman, a profusion of grapes and luscious pears, the latter resembling in color and taste the Bergamot pears, but different in shape, being longer and larger

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* Subsequently to my leaving the Ciudad de los Angeles, the entire plan of the fort wa changed, and I am not the projector of the work finally adopted for the defence of that town

January 15.—The details to work on the fort were by companies. I sent to Captain Tilghman, who commanded on the hill, to detach one of the companies under his command to commence the work. He furnished, on the 16th, a company of artillery (seamen from the Congress) for the day's work, which they performed bravely, and gave me great hopes of success.

January 18, 19, *and* 20.—I received special orders which separated me from the command, and the party of topographical engineers that had been so long under my orders.

The battles of the 6th December, and the 8th and 9th January, had forever broken the Mexican authority in California, and they were daily coming in, in large parties, to sue for peace, and every move indicated a sincere desire on the part of the more respectable portion of the Californians to yield without further struggle to the United States authorities; yet small parties of the more desperate and revengeful hung about the mountains and roads; refusing or hesitating to yield obedience to their leaders, who now, with great unanimity, determined to lay down their arms. General Flores, with a small force, was known to have taken the road to Sonora, and it was believed he was on his way to that province, never to return to California.

Leaving General Kearny at San Juan de Capristano; on his return to San Diego, I took three men and pushed on for the latter place. Halting late in the evening at the deserted Indian rancheria of Santa Margarita, we broke open one of the Indian huts, and got some corn and pumpkins for our animals. When night came on, the number of insects about the hut, and the intolerable noise made by the wolves, kept us from sleep. The moon shone brightly, and about ten at night we saddled up to pursue our journey.

In this determination we were confirmed by the unexplained movement of several small parties of mounted Californians that reconnoitred our camp; a circumstance which afforded additional proof that some of the Californians were yet in arms, and led us very reasonably to the conclusion that our only safety was in changing our camp. We reached the mission of San Luis Rey, and found not a human being stirring. The immense pile of building, illuminated by the pale cold rays of the moon, stood out in bold relief on the dim horizon, a monument of the zeal of the indefatigable priests by whom it was built. Now untenanted and deserted, it offered no resting place for the weary and hungry, and we rode on, determined to halt at the first place where grass should be in abundance.

The road here divides into two branches; one leads to the west, by the rancheria of San Barnardo, the other directly to San Diego, over the high lands, running nearly parallel to the sea coast. The first is that by which we had marched on the Pueblo de los Angeles, fearing that the hills on the sea coast road would embarrass the movement of our military and ox-carts.

Without a guide, we had great difficulty in striking at night the trail leading over the mountains; but consulting the stars for our course, and relying upon the sagacity of my three men, who had passed most of their days in traversing untrodden regions, we jogged along, shivering with the cold air of the elevated hills.

About twelve, we came to a large patch of luxuriant grass, wet with dew. Upon this we loosened our animals and attempted to get a little sleep, but, in the absence of blankets or fire, the cold deprived us of repose, and the dawn of day found us again in our saddles.

The only habitation on the road from San Louis Rey to San Diego is a hut about half way, where there is a good spring. Its occupants had just returned from the wars, quite as hungry as we were. They had preceded us not more than twenty minutes, yet they had a fat bullock killed, and choice bits of his flesh roasting before the fire. We outnumbered the party, and consequently received their hospitality, which was extended to us with a good deal of bon-hommie.

They conversed freely of the battles fought but a few days before, acknowledged their participation in them, and expressed themselves satisfied of the uselessness of farther resistance without aid from Mexico.

The fresh meat of a bullock is all that is required by the Californian for breakfast, dinner, and supper.

Bread, tea, and coffee are rarely, if ever, used, and even when within their reach, looked upon with indifference.

We very soon fell into their habits, and it is probable the troops in California, at this time, would not consider it an excessive hardship to make a campaign with no other stores in the commissariat than a plentiful supply of fresh beef. The white teeth of the Californians, and the blood tingling in the cheeks of their olive colored faces would seem to prove this beef to be a very healthy diet.

The advantages in the movement of troops that are contented with this kind of subsistence is very great, enabling them to move without wagons, and with no other care for the morrow than herding the animals intended for food.

Our host was so well pleased with the manner in which we acquitted ourselves at his rude repast, that, forgetting old animosities, he saddled up his jaded horse, and piloted us for five or six miles, until we reached the broad trail leading to the Solidad.

About midday we reached San Diego, and next morning, taking leave of my men and the animals that had done us such good service, I embarked on board the prize brig Malek Adhel, commanded by Lieutenant Schenck, of the navy, and prepared to take my leave of Upper or Alta California. Before doing so, however, I may venture upon a few general remarks, based upon personal observations, upon the topography, climate, and products of that portion of the country not covered by my survey, or that of others. These observations were made after I had become separated from my assistants and instruments, my mind being engrossed with other subjects. The information contained in them is, therefore, less precise than that contained in other portions of my journal.

The region extending from the head of the Gulf of California to the parallel of the Pueblo, or Ciudad de los Angeles, is the only portion not heretofore covered by my own notes and journal, or by the notes and journals of other scientific expeditions fitted out by the United States.

The journals and published accounts of these several expeditions combined, will give definite ideas of all those portions of California susceptible of cultivation or settlement. From this remark is to be excepted the vast basin watered by the Colorado, and the country lying between that river and the range of Cordilleras, represented as running east of the Tulare lakes, and south of the parallel of 36°, and the country between the Colorado and Gila rivers.

Of these regions nothing is known except from the reports of trappers, and the speculations of geologists. As far as these accounts go, all concur in representing it as a waste of sand and rock, unadorned with vegetation, poorly watered, and unfit, it is believed, for any of the useful purposes of life. A glance at the map will show what an immense area is embraced in these boundaries; and, notwithstanding the oral accounts in regard to it, it is difficult to bring the mind to the belief in the existence of such a sea of waste and desert; when every other grand division of the earth presents some prominent feature in the economy of nature, administering to the wants of man. Possibly this unexplored region may be filled with valuable minerals.

I have alluded, elsewhere, to the population of this country, the savage character of which is another obstacle to its exploration, and has tended to veil in mystery its true character and resources.

Alta California, between the 31st and 34th parallels of latitude, presents to the eastern man, accustomed to navigable rivers and broad estuaries of the ocean topographical features of a very unusual character.

Two chains of mountains traverse the country in a direction nearly parallel to the sea coast, slightly converging towards each other, and finally uniting near the parallel of 32°. Here they form the promontory of Lower, California, extending its entire length, and terminating abruptly in the ocean at Cape San Lucas.

The first chain (that nearest the coast) may be considered a *steppe* of the second or interior range of mountains. It impinges on the coast at three different points, Santa Barbara, San Juan de Capristano, and between San Luis Rey and San Diego—at the first two places with so much boldness as to make it necessary to conduct the road along the margin of the sea, between the lines of high and low water mark, so that both Santa Barbara and San Juan present points worthy of consideration to the military commandant charged with the defence of that country.

Between the first and second ranges of mountains there is a valley, traversed by a good road, leading directly from the great desert to the Pueblo de los Angeles, and a defending force would meet its adversary to the greatest advantage at Cariso Creek, the termination of the "jornada" across the desert. The description and locality of Cariso Creek has already been given.

The second or principal range of mountains lies at no great distance from the first, and the valley between offers some arable land. The distance between the first range and the sea coast varies from

1 to 20 or 30 miles. The surface covered with vegetation, though small, is difficult to estimate; and perhaps it is unimportant that an estimate should be made, since the productiveness of these regions depends on other considerations than smoothness of surface and character of soil. The rains cannot be relied upon, and the tiller of the earth depends upon irrigation from the mountain streams for his crops. The extent of ground capable of tillage is thus reduced to very narrow limits, easy of computation. A knowledge of the water courses, their fall, volume and extent, and the quantity of lands on their margin, within the level of these waters, are the data upon which the computations must be based.

Taking this as a guide, an inspection of the accompanying map will give a general idea of the extent of arable ground, sufficiently correct for all practical purposes; but, in candor it should be said, that many streams laid down in it disappear in the sand, while the rocky cliffs, forming the banks of others, render irrigation impracticable. The scale upon which the map is projected is too small to represent these accidents of the ground.

Where irrigation can be had in this country, the produce of the soil is abundant beyond description. All the grains and fruits of the temperate zones, and many of those of the tropical, flourish luxuriantly.

Descending from the heights of San Barnardo to the Pacific, one meets every degree of temperature. Near the coast, the winds prevailing from the southwest in winter, and from the northwest in summer, produce a great uniformity of temperature, and the climate is perhaps unsurpassed in salubrity. With the exception of a very few cases of ague and fever of a mild type, sickness is unknown.

The season of the year at which we visited the country was unfavorable to obtaining a knowledge of its botany. The vegetation, mostly deciduous, had gone to decay, and no flowers nor seeds were collected. The country generally is entirely destitute of trees. Along the principal range of mountains are a few live oaks, sycamore, and pine; now and then, but very rarely, the sycamore and cotton-wood occur in the champaign country, immediately on the margins of the streams.

Wild oats everywhere cover the surface of the hills, and these, with the wild mustard and carrots, furnish good pasturage to the immense herds of cattle which form the staple of California.

Of the many fruits capable of being produced with success, by culture and irrigation, the grape is perhaps that which is brought nearest to perfection.

Men experienced in growing it, and Europeans, pronounce the soil and climate of this portion of California unequalled for the quality of the wine expressed from it.

We sailed from San Diego on the 25th of January, and coasted along the rocky and barren shores of Lower California. The information in reference to this country, which it was in my power to obtain, is not so precise as that which might be derived from an actual survey, and I have therefore embodied it in the appendix.

I have the honor to be, very respectfully, yours,

W. H. EMORY.

APPENDIX No. 1.

New York, *October* 1, 1847.

Dear Sir: I return you my thanks for the very interesting information contained in your letter of the 20th September.*

It unfortunately happens that I cannot wait for the arrival of your papers, or for the publication of the map of the War Department. My essay makes part of the second volume of the transactions of the New York Ethnological Society. The work is now in the press, completed with the exception of my essay; and the printer presses me for it. The map, which will accompany it, is principally intended to show the the original abodes of the Indian tribes. It will be presented as a sketch, without pretensions to accurate correctness. But there is a consideration, which makes me anxious to obtain every possible information respecting the Rio Gila, and especially its upper waters.

You may not be aware that a work has lately been recovered and published, which contains a full and authentic account of an expedition in the year 1540–1542, by order of the viceroy Mendoça, and under the conduct of Vasquez Coronado. It consisted of 350 Spaniards and 800 Indians. Setting off from Culiacan, they reached the sources of the Rio Gila, passed across the mountains to the Rio del Norte, wintered twice in the province now called New Mexico, explored it through its whole length, from north to south, and afterwards, taking a northeast course, crossed the mountains, reached the buffalo plains, through which they wandered a considerable distance eastwardly, and as far north as the 40th degree of latitude. Finding no gold, they returned to Mexico. The Spaniards did not re-enter the country till the year 1581; and the conquest of New Mexico was not completed till about the year 1595.

The veracity of the narrator, Castenador, who was a volunteer in the expedition, and who wrote the account twenty years after, is fully established by a variety of circumstances, too multiplied to be inserted here. It is sufficient to say, that the Indians of the Rio Gila, and of the upper valley of the Rio del Norte, were an agricultural people, cultivating maize, beans, pumpkins, and cottons, depending exclusively on agriculture for their subsistence, dwelling in villages built of mud, (torchis,) mixed with certain balls of hardened matter, and well cemented together. The houses were generally four stories high, and with no opening on the first floor, accessible only by movable ladders, with top terraces, and an under ground apartment, occupied exclusively by the men, and used as *estufas;*

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* This letter gives a general outline of the route, and twenty words of the Coco Maricopas language, and a few of the Pimos.

in short, similar in every respect to the existing pueblos of New Mexico, and to the ruins of the Casas Grandes ascribed, as I think erroneously, to the Aztecs.

With respect to New Mexico, one principal want is that of vocabularies, which would at once settle the question of identity with any of the Mexican nations. The same difficulty exists with respect to all the tribes of the country drained by the great Rio Colorado of the west. But there is an additional embarrassment respecting the actual situation of what were called the seven villages of Cibola; of which we can only say, that they were situated in a narrow valley, six leagues long, and on the very sources of some one branch of the Rio Gila.

The phenomenon of this insulated semi-civilized population, is, in itself, remarkable, and difficult to be explained; and the discovery of the precise spot where the seven Cibola villages were situated is especially desirable. With this object in view, I beg leave to submit to you the following queries.

1st. On leaving the copper mines, on the 18th of October, and after having crossed the Sierra Mimbres, you reached the main branch of the river Gila, on the 20th; now, what I wish to know, is, from what quarter did that main branch come? or, in other words, if you had ascended that main branch, what was its apparent course? What was the distance from the western foot of the Sierra Mimbres to that main branch, where you struck it? Did you, along that distance, cross any tributary streams of the Rio Gila, and from what quarter did they come?

2d. Can you furnish me with the approximate latitude of some of the principal points observed when descending the river; principally the junction of the Salinas, the village of the Pimos Indians, any other spot where evident traces of ruins were discovered, and the mouth of the river Gila. From what quarter did the river Salinas come? Did you carry time with you, so as to obtain the relative longitudes of some points? The most important would be the spot where you left the Rio del Norte, that where you struck the main branch of the Gila, the mouth of the Salinas, the Pimos village, and the mouth of the Rio Gila. If you had no other means, still your travelled distance may give a rough approximation.

It seems to me that the easiest way to answer these two queries, would be, a rough approximate sketch of the country traversed by you. I will take special care not to commit you in any way. I am no plagiarist, and I must, in general terms, acknowledge that I am indebted to you for some important information; but I will, at the same time refer to your intended complete report and map, which will give that precise information which was not within my reach.

3d. You did not visit the mouth of the great Rio Colorado; but General Kearny states, in his letter, that the mouth of the Gila was in about latitude 32°; that he crossed the Colorado ten miles below, and marched near it for thirty miles, when he left it, (turning off eastwardly, across the desert,) without having reached its mouth. Now, the generality of our maps place the mouth of the Colorado in latitude 32°, and it is clear from what precedes, that it must be nearly one degree further south. Do you think that I may in my sketch set it down at about latitude 31°?

4th. The cultivation of cotton is one of great general importance. As now informed, I believe that, independent of varieties, there are but two distinct species: the black seed, which is the native American, and found as such nowhere else, and the green seed which adheres to the staple, of Asiatic origin, thence brought to the Levant and the Mediterranean, and imported into North America, of which it was not a native I cannot obtain in this city a copy of Bonpland's great botanical work, which would have thrown much light on the subject. I wish now to know, whether you took any notice of the cotton cultivated by the Pimos, and what species it was? I presume that it was not a native of that region, and that the seed must have been imported from Mexico.

I now proceed to that which relates to the Indians, who are the principal objects of my researches.

1st. I have compared your vocabulary of the Coco Marricopas with those of the four Mexican languages in my possession, and of thirty-two well ascertained families of Indians, living within the United States or further north, and have found no resemblance with either. It is to me a quite new language, but there is a remarkable word. *Apache* is the word for *man*; and judging by analogy from several other Indian languages, they should be Apaches or belonging to that family. Thus, for instance, amongst the Algonquin tribes, the names assumed by two of them, Illinois and Linno Linap, are evidently derived from Linno, a man. However this may be, I wish to have some further information respecting that tribe; to know, with as much precision as you can, the quarter whence they came; their present location in reference to the Pimos, and particularly whether and what they do cultivate; also, whether they are wilder than the Pimos, and whether on good terms with them.

2d. You say that the accounts, by report, of the Indians to the mouth of the Gila are conflicting and of an indefinite character. This observation applies to every information derived from other sources. We have as yet only vague rumors. Yet I wish to collect all these, as far as possible. A few legitimate inferences may, perhaps, be drawn by comparing them together; but it is principally for the purpose of enabling me to point out the most important objects of inquiry that I wish to be thus informed. You will, therefore, oblige me by communicating such rough notes as you may have taken on that subject, and also what were the abodes and occupations of the few scattered Indians whom you met on your journey.

(a.) Have you, by any direct observation, ascertained within 30′ the positive longitude, in reference to Greenwich, of any point on the Rio del Norte or vicinity which may serve as a starting point?

There must be some kind of a dividing ridge which separates the waters of the river Gila from the waters that empty into the gulf of Mexico. From what you say of Colonel Cooke's route, I would infer that he left the Rio Norte a short distance above El

Paso, and that he must have travelled south of that ridge, in an almost due west course to the Rio Colorado.

I use the word "Sierra Madre" in the sense attached to it by the Mexicans, viz: that ridge which separates the waters that fall into the Atlantic from the rivers which empty into the Pacific ocean, without any regard to its elevation.

I pray you to accept the assurances of my distinguished consideration and personal regard.

Your most obedient and faithful servant,

ALBERT GALLATIN.

To Lieutenant W. H. Emory,
U. S. Topographical Engineers, Washington.

Washington, *October* 8, 1847.

Dear Sir: In answer to your letter of the 1st instant, I have the pleasure to send you, with the permission of the chief of my department, a table of twenty-three geographical positions determined by myself, which you are at liberty to use; and, should you think the information of sufficient importance, I should feel much flattered that you should, as you propose, communicate them to the Ethnological Society of New York for publication.

No astronomical observations, that I am aware of, have ever before been made on the same grounds, if we except the observations of Dr. Coulter at the mouth of the Gila, which have never yet been published.

You will see that the position of the Gila is very much changed, as well as that of Santa Fé, in New Mexico.

The observations were made with an 8½ inch sextant, constructed by the celebrated Gambey, of Paris. In most cases, the determinations of the places in latitude are the mean of the results obtained by many observations on north and south stars, of nearly equal altitudes, by which the errors of eccentricity, &c., in the instrument were avoided.

The longitudes are derived from a combination of the results from the chronometers, and measurement of distances between the moon and stars, nearly equi-distant on either side of it.

The chronometers used were two very good box chronometers, by Parkinson & Frodsham, (Nos. 783 and 2075.)

The observations themselves, including those between Santa Fé and Fort Leavenworth, (our point of departure,) in number 2,500 or 3,000, were all computed in the field, and are now undergoing verification by Professor Hubbard, a very accurate young computer, attached to the observatory at Washington.

The computations for all the points embraced in the table sent you, have been verified.

The objects of our expedition being purely military, the subjects of interest to scientific men were only pursued so far as they were incidental to the expedition, and did not interfere with its great object. The instruments with which I was furnished were not those perhaps, which I would have selected; at the same time there was nothing for me to regret, except the absence of a good portable telescope, with which occultations of the fixed stars by the moon, and the immersion of Jupiter's satellites, could have been observed, and a few pocket chronometers.

We left Washington on twenty-four hours' notice, and time was not allowed to procure either the telescope or pocket chronometers.

1st. We struck the Gila, as the table will show, in latitude 32° 44′ 52″ and longitude 108° 45′ west from Greenwich; thence its course is very nearly west. As well as we could judge from the course of the mountains, its course from that point to its source was not very far from northeast or southwest.

No tributaries to the Gila were crossed before reaching it, except one named by me Night creek, a very insignificant stream. The Sierra Mimbres, 6,000 feet above the sea at the highest point where we crossed it, falls gradually and almost imperceptibly to the Gila.

2d. Your second interrogatory is answered principally, by the table of geographical positions.

The Rio Salinas comes in from the *northeast*, a little west and north of camp 97, of November 12. (See table.) This camp, the astronomical position of which is given in the table, is about midway between the villages of the Pimos and Coco Marricopas Indians.

3d. The table will show you that the junction of the Gila and Colorado is on the parallel of 32° 43′ or 4′; and, in the absence of more specific information, I would advise you to place the mouth of the Colorado on the parallel of 31° 51′, which is the latitude given it by Lieutenant Hardy, of the royal navy, whose little book of travels in Mexico you have no doubt seen.

4th. Specimens of the seed of the cotton grown by the Pimos were obtained, but they have not yet reached me. Overcoming space was the great object we had in view when we passed the Pimos, and our investigations and collections were necessarily hasty and superficial. We passed with them only the part of a day, whereas, if exploration alone had been the object of our party, I should have considered a week as little enough to have devoted to this interesting people. When I left California, it was as a special envoy to the government, and on so short a notice that many of my collections and notes were left behind, with my assistants. Among the things so left, were the seed of the cotton.

Most of the plants collected, however, were brought home. These will show a very complete history of the botany of the country. They are in the hands of Doctor Torrey, who is preparing an elaborate catalogue and drawings of those plants, heretofore unknown. This catalogue I should be very glad to place at the disposal of your society.

The Coco Marricopas Indians come from the West. So late as 1826, Mr. Kit Carson, one of our guides, met these people at the mouth of the Colorado. Subsequently to that period, they were visited by Dr. Anderson (whom we met in Santa Fé) at a point about half way between their present village and the mouth of the Gila river.

They are taller and more athletic than the Pimos, and what struck me as very remarkable, the men had generally aquiline noses, whilst those of the women were retrousses.

They occupy thatched cottages, thirty or forty feet in diameter, made of the twigs of cotton-wood trees, interwoven with the straw of wheat, corn stalks, and cane.

Cotton, wheat, maize, beans, pumpkins, and watermelons are the chief agricultural products of these people. Their fields are laid off in squares, and watered, by the zequias, from the Gila river. Their implements of husbandry are the wooden plough, the harrow, and the cast-steel axe, (procured probably from Sonora) They have but few cattle, and not many horses. I observed, domesticated among them, ducks, chickens, and pigs. They had many ornaments of sea shells, showing, in my opinion, their recent migration from the gulf. From the character given of them by Carson, when he saw them in 1826, although they were then an agricultural people, I should think they had learned much by their proximity to their neighbors, the Pimos, whom they acknowledge as politically their superiors, and with whom they live on terms of intimate and cordial friendship.

The Marricopas impressed me as a more sprightly race than the Pimos; the interpreters of the Pimos were all natives of the Marricopas band,

The dress of both nations or bands was the same. That of the men a breech cloth and a cotton serape of domestic manufacture; that of the women the same kind of serape pinned around the waist and falling below the knees, leaving the breast and arms bare.

Both nations cherished an aversion to war, and a profound attachment to all the peaceful pursuits of life. This predilection arose from no incapacity for war, for they were at all times able and willing to keep the Apaches, whose hands are raised against all other people, at a respectful distance, and prevent depredations by those mountain robbers, who hold Chihuahua, Sonora, and a part of Durango in a condition approaching almost to tributary provinces.

They have a high regard for morality, and punish transgressions more by public opinion than by fines or corporeal punishments. Polygamy is unknown amongst them, and the crime of adultery, punished with such fearful penalties amongst Indian nations generally, is here almost unknown, and is punished by the contempt of the relatives and associates of the guilty parties.

The Indians we met between the Del Norte and the Pimos settlement were mostly wild Indians of the great Apache nation, which inhabits all the country north and south of the Gila, and both sides of the Del Norte, about the parallel of the Jornada and Dead Man's lakes.

They have no fixed habits, and the only vestiges of their abodes which we saw were temporary sheds, a few feet high, made of the twigs of trees. They live principally by plundering the Mexicans of New Mexico, Chihuahua, Sonora, and Durango.

No vocabulary of their language was procured. I am inclined to think they extend up to the head waters of the Gila.

Beyond them to the north is the warlike nation of the Navajoes, who, Mr. Fitzpatrick thinks, are allied to the Crow Indians.

Near the head waters of the Salinas, which runs in a course, it is said, nearly northeast and southwest, is a band of Indians called the Soones, who, in manners habits and pursuits, are said to resemble the Pimos, except that they live in houses scooped from the solid rock. Many of them are Albinos, which may be the consequence of their cavernous dwellings. Surrounded by the warlike Navajoe, and the thieving Apache, they nevertheless till their soil in peace and security.

Coming farther east we reach the San José, a tributary to the Puerco, which is tributary to the Rio del Norte from the *west*, not the Rio Puerco represented on the map to flow into the Del Norte south of El Passo.

Here is an Indian race living in four story houses, built upon rocky promontories inaccessible to a savage foe, cultivating the soil and answering the description of the seven cities of Vasquez Coronado, except in their present insignificance in size and population, and the fact that the towns, though near each other, are not in "a (continuous) valley six leagues long," but on different branches of the same stream. The names of these towns are Cibolletta, Moquino, Pojnato, Covero, Acona, Laguna, Poblacon; the last a ruin.

I did not visit these towns in person; but I hope to get a minute description from one who did, and, should I succeed, it will be sent to you.

The work you mention, of Castenada, has never been seen by me: My own impression, and it is so stated in my journal, is that the many ruins we saw on the Gila might well be attributed to Indians of the races we saw in New Mexico, and on the Gila itself. I mean by the last, the Pimos, who might easily have lost the art of building adobe or mud houses. In all respects except their dwellings they appeared to be of the same race as the builders of the numberless houses now level with the ground on the Gila river.

The implement for grinding corn, and the broken pottery, were the only vestiges of the mechanical arts which we saw amongst the ruins, with the exception of a few ornaments, principally immense well turned beads, the size of a hen's egg.

The same corn grinder and pottery are now in use among the Pimos. The corn grinder is merely a large stone, well worn, slightly concave, and another of different shape, convex, intended to fit the first, and crush the corn between by the pressure of the hand.

The ruins on the Gila were first seen at camp 81, the position of which is shown in the table, from thence to the Pimos village. Wherever the mountains did not impinge too close on the river and shut out the valley, they were seen in great abundance, enough, I should think, to indicate a former population of at least one hundred thousand; and in one place, between camps 91 and 97, there is a long wide valley, twenty miles in length, much of which is covered with the ruins of buildings and broken pottery.

These ruins are uniformly of the same kind; not one stone now remains on the top of the other; and they are only discoverable by the broken pottery around them, and stone laid in regular order, showing the trace of the foundation of a house.

Most of these outlines are rectangular, and vary from 40 × 50 to 200 and 400 feet front. The stone are unhewn, and are mostly of an amygdaloid, rounded by attrition.

Now of the tributaries which come into the Gila from the north, there are several besides the Salinas, which, at their mouths, are insignificant in size and can be stepped across; but in this whole region no legitimate inference can be drawn of the size of a river, throughout its course, from that at any one point.

It may be large near its source, and after traversing deserts of sand through arid regions unwatered by rains, become very small, and even disappear altogether.

Therefore, except the Salinas, of which we have oral accounts, nothing is known or can be inferred of the magnitude of these tributaries from their appearance at the junction. These tributaries come in near camp 81, where the mountains are so precipitous and bold no conjecture can be formed of their course.

The Salinas must have been the branch by which the expedition of Coronado ascended and crossed into New Mexico. Its general direction is not far from a line drawn from its mouth to Santa Fé, and nearly in this line are the seven towns mentioned as being on the head waters of the San José. Indians now pass from the Pimos village to New Mexico on this route.

I omitted to mention, in its proper place, that we were informed by an intelligent Marricopas Indian that, about fifty miles from the mouth of the Salinas, was now standing, in a perfect state of preservation, the walls of a large three story building of mud, with its interior sides glazed and finely polished, and about it was to be seen many traces of large zequias, and broken pottery in great abundance.

There is another tribe of Indians called the Moquis, who, like the Pimos and Soones, cultivate the soil and live in peace with their neighbors; but the exact locality of this tribe I do not know, beyond the fact that it is on or near the head waters of some of the tributaries of the Gila.

I am, with great respect, your obedient servant,

W. H. EMORY.

APPENDIX No. 2.

College of Physicians and Surgeons,
New York, *February* 10, 1848.

My Dear Sir: I have examined the interesting collection of plants which you kindly placed at my disposal, and herewith send you a list of them, as complete as my numerous engagements permit me to make at present. The route which you passed over is exceedingly rich in botanical treasures, as is evident from the number of new species and genera which you were enabled to make under great disadvantages, and in an expedition which was almost wholly military in its character. Most of the new plants which you found are only indicated, or, at most, very briefly described in the following list. A more full account of them will be given hereafter.

I am, my dear sir, very respectfully, yours,

JOHN TORREY.

To Lieutenant Colonel W. H. Emory.

July 22, 1847.

My Dear Sir: I give you the following written sketch of the route, not being able, as you request, to get a trace made from my map.

From the 27th June to July 11th, we were traversing the country between Fort Leavenworth and the bend of the Arkansas, a rich rolling prairie embraced between the 39th and 38th parallels of latitude, and the 94th and 98th meridians of longitude.

From July 11th to July 13th, followed the Arkansas to Pawnee fork, in longitude about 99. At this point the fertile soil ceases, except on the immediate margin of the streams.

From the 14th July to August 1st, we were in the valley of the Arkansas, occasionally crossing the spurs of low hills which interrupt the direct course of the Arkansas. This part lies in latitude 38°, and between longitude 99° and 103° 1′.

From the 1st August to the 8th, crossing the plain in a southerly direction and mounting the Ratón mountain, about 7,000 feet above the sea, between latitudes 38 and 36.

From the 8th August to the 14th, in the valleys of the tributaries to the Canadian, and crossing the extensive plains between these valleys.

From the 14th August to the 18th, ascending the great ridge between the head of the Canadian and the waters of the Del Norte, halting at Santa Fé, in latitude 35° 41′, on a tributary of the Del Norte, about 15 miles distant from the Del Norte, and about 1,500 feet above that river and 6,850 above the sea.

From August 18th up to the 14th October, all the collections were made in New Mexico, in the valley of the Del Norte, or on the table lands adjacent, and between Santa Fé and the 33d parallel of latitude, (230 miles below Santa Fé.)

From the 14th October to the 19th, we were crossing the great dividing ridge between the waters of the Del Norte and the waters of the Gila, nearly on the 33d parallel of north latitude, and between the 107th and 109th meridians of longitude, measured from Greenwich. The greatest height of this dividing ridge along our trail was about 6,000 feet above the sea.

From the 19th of October to the 22d November, we were following the course of the Gila river, occasionally forced into the mountains to avoid the cañons. This route is never far from the 33d parallel of latitude, and is embraced between the 109° and 114° 30′ meridians of longitude, falling, during that distance, very uniformly from about 5,000 feet to near the level of the sea.

From the 22d November to the 24th, we were on the Colorado of the west, traversing a low sandy bottom.

From the 24th November to the 28th, we were crossing the great desert of drifting sand, in a course little north of west.

On the 28th November, we encamped at the Cariso (Reed) creek or spring, the waters of which, when first exposed, are warm, and emit the smell of sulphuretted hydrogen.

From the 28th November, we commenced to ascend the Cordilleras of California, (the continuation of which forms the peninsula of Lower California,) and reached the highest point of the route December 5th, 3,000 feet above the sea, and as many below the overhanging peaks. From that point we descended to San Diego, a seaport on the level of the sea, in latitude 32° 45′ and longitude 170° 11′ west of Greenwich. This point we reached December 12.

With great respect, very truly yours,

W. H. EMORY.

Professor Torrey, *Princeton.*

APPENDIX BY PROFESSOR TORREY.

RANUNCULACEÆ.

Ranunculus aquatilis, *Linn.* Plains of the Arkansas.

Clematis Virginiana, *Linn.* Raton mountain. An undetermined species of this genus was found in fruit, November 10th, on the Gila. The plumose tails of the carpels are nearly three inches long.

BERBERIDACEÆ.

Berberis pinnata, *Lagasca.* Highlands bordering the Gila; this appears to be a common species in the southern part of Upper California, and in Northern Mexico.

CRUCIFERÆ.

Lepidium ruderale, *Linn.* Valley of the Arkansas.

Erysimum Arkansanum, *Nutt.* Tributaries of the Canadian.

CAPPARIDACEÆ.

Polonisia graveolens, *Raf.* In flower and fruit, Sept. 26—October 3, valley of the Del Norte. The plant is taller, and the flowers are considerably larger than in the form that is common in the northern United States.

Cleome integrifolia, *Nutt.* This beautiful species is abundant on both sides of the mountains, from the plains of Oregon, and the upper waters of the Platte, to latitude 33° north.

VIOLACEÆ.

Viola cucullata, *Linn.* Pawnee fork of the Arkansas.

PORTULACACEÆ.

Portulaca oleracea, *Linn.* On the Arkansas. Perhaps introduced.

Sesuvium portulacastrum, *Linn.* In flower and fruit, Nov. 17. Saline soils along the Gila. Leaves spatulate. Flowers nearly sessile, stamens numerous. Styles 3.

GERANIACEÆ.

Geranium Fremontii, *Torr. in Frém. 2d Rep.* On the Raton.

ZYGOPHYLLACEÆ.

Kallstrœmia maxima, *Torr. and Gr.* Tribulus maximus, *Linn.* Tributaries of the Canadian.

Larrea Mexicana, *Moricand, pl. nov. t.* 48 *"Creosote plant.' Iodeodondo* of the New Mexicans. Used externally for rheumatism. A shrub from three to six feet high. Abundant from the upper waters of the Arkansas and valley of the Del Norte, to the great sandy deserts of California. It likewise occurs in the northern parts of Mexico. The plant abounds in a strong smelling resinous matter. No animal seems to feed on it, and it is useless for fuel, as it can scarcely be made to burn.

ANACARDIACEÆ.

Rhus glabra, *Linn.* From the upper part of the Arkansas to longitude 107°.

R. laurina, *Nutt.* A large shrub. Mountains of California, towards the sea coast.

R. trilobata, *Nutt.* On the Gila. A shrub 18 inches high, found late in the autumn, with staminate aments nearly matured for the following spring. The whole plant is clothed with a dense velvety pubescence. It is, perhaps, a distinct species from *R. trilobata.*

MALVACEÆ.

Malva Munroana, *Dougl.* High sandy plains, and in the valley of the Gila. Flowers bright rose color.

M. pedata, *Torr. and Gr.* Upper part of the Arkansas.

Sphæralcea stellata, *Torr. and Gr.* Near Santa Fé, &c. Highlands between the Del Norte and the Gila.

Sida coccinea, *DC.* On the Raton mountain. Several other undetermined Malvaceæ occurs in the collection.

SAPINDACEÆ.

Sapindus marginatus, *Willd* (*soap berry.*) Valley of the Gila.

RHAMNACEÆ.

Ceanothus ovalis, *Bigel.*, *Torr. and Gr.* On the Arkansas. A small scrubby species of this genus was found on the Cordilleras of California, towards San Diego. It has thorny branches, small ovate coriaceous, smooth entire leaves, which are supported on short petioles. The branches are glabrous and glaucous. There were neither flowers nor fruit on the specimen.

C. ovalis, *var.* intermidius, *Torr. and Gr.* On the Arkansas.

LEGUMINOSÆ.

Sesbania macrocarpa, *Muhl.* On the Gila. In fruit November 20.

Glycyrrhiza lepidota, *Nutt.* Near Santa Fé. Not found in flower.

Psoralea esculenta, *Pursh.* (Pomme de Prairie.) On the Arkansas.

P. floribunda, *Nutt.* With the preceding.

Amorpha fruticosa *Linn.* On the Gila. The specimens were without flower and fruit, and we therefore cannot be certain of the species.

Dalea formosa, *Torr. in Ann. lyc. N. York*, 2. *p*. 178. This beautiful species was first detected by Dr. James, in Long's first expedition. It is a shrub about three feet high, with numerous crooked branches, and purplish flowers. Near Santa Fé, and valley of the Del Norte.

D. **alopecuroides**, *Willd.* With the preceding.

D. **laxiflora**, *Pursh.* Valley of the Arkansas.

Besides these Daleæ, there were two other species, both shrubby, in the collection; but I have not ascertained whether they may not be already described. One of them is densely branched; the leaflets are in six to seven pairs, broadly obovate connate about 3 lines long, glabrous above, very villous, and furnished with large dark colored glands toward the margin underneath; they are obscurely toothed. The flowers are in short dense spikes; calyx with plumose subulate-setaceous teeth, which are as long as the tube. This species was found on the Gila river. It is very near D. ramosissima, Benth. in Bot. Sulph., p. 11., t. 10.

The other species is canescently tomentose, and diffusely branched. The leaflets are narrowly oblong, in three to four pairs, which are distant. On both sides they are sparingly furnished with small red glands, which are nearly concealed in the down. The flowers are in short loose spikes, small, purple. Calyx-teeth subulate, shorter than the tube, plumose. Found on the great desert west of the Colorado.

Petalostemon gracile, β. **oligophylum**. Stem erect; leaflets in 2—3 linear, slightly dotted underneath; calyx glabrous, longer than the subulate bracts, the teeth very short, ovate; petals oblong. Valley of the Del Norte.

Prosopis glandulosa, *Torr. in Ann, Lyc. N. York*, 2. *p*. 192, *t*. 2. (mezquite.) Abundant in the valleys of all the rivers, from Santa Fè, west. The trunk of this tree is sometimes 14 inches in diameter. The pods are long, flat, and filled with a sweetish pulp. They are excellent food for horses and are sometimes used by men in times of scarcity.

P. (**Strombocarpa**) **Emoryi**, *n. sp*. Branches glabrous; spines in pairs, slender, short, straight, pinnæ a single pair; leaflets about 4 pairs, oblong, somewhat corriaceous; the under surface and the petioles somewhat pubescent; legume spirally twisted into a compact cylinder. Found in fruit only; on the Gila river. This species is nearly allied to the P. odorata of Frémont's 2d report, but differs in its shorter, broader, and less numerous leaflets.

Schrankia uncinata, *Willd.* On the Arkansas, where it is called *sensitive vine*.

Darlingtonia brachyloba, *DC.* With the preceeding.

Several other Mimoseæ are in the collection, but the specimens are mostly without leaves and flowers,

Cassia chamæcrista, *Linn.* On the Arkansas.

ROSACEÆ.

Cerasus ilicifolius, *Nutt.* Mountains of California. The kernel of the fruit has a strong flavor of bitter almonds.

Geum Virginianum, *Linn.* On the Arkansas.

Fallugia paradoxa, *Endl. gen.* 6385, *Sieversia paradoxa*, *Don in Linn., trans.* 14, *p.* 576, *t.* 22. A remarkable rosaceous shrub, with white flowers, and very long slender plumose tails to the carpels. It differs, in some respects, from Endlicher's character of the genus, but I have not had an opportunity of comparing it with Don's description and figure. It was found in various parts of the valley of the Del Norte. Can it be *Geum dryadoides*, *DC?*

Cercocarpus parvifolius, *Nutt.; Torr, and Gr ; fl.* 2, *p.* 427. A shrub about 12 feet high, with numerous straight branches springing from near the ground. The carpels, with their long plumose spirally contorted *awns*, bore into the earth, after they have fallen. The action of the wind communicates to them a twisting motion, and retorce pubescence retains them in soil.

Spiraea Californica, *n. sp.* Shrubby; leaves ovate, lanceolate, undivided nearly glabrous, gladularly serrate, conspicuously petiolate; flowers in compound corymbs, perfect; calyx-segments broad, about as long as the tube; disk coherent with the tube of the calyx; stamens numerous; carpels 5, distinct, 2-valved; seeds 2, ascending, the testa expanded at the superior extremity into a membranaceous wing. Grows on high mountains near the Gila. This species is remarkable for its ascending winged seeds, and coriaceous leaves. It can scarcely be referred to any of the sections into which the genus Spiraea is at present divided.

Andenostoma fasciculata, *Hook and Arn.* Abundant in the Cordilleras of California. A shrub about five feet high.

A. sparsifolia, *n. sp.* Leaves scattered, linear-subulate, dotted with glands. Cordilleras of California. A tree 30 feet high with very numerous slender branches. Leaves nearly half an inch long, scarcely half a line wide, somewhat triangular, apparently evergreen. Flowers in small terminal paniculate spikes. Pedicels short, with numerous minute scarious bracts at the base. Calyx turbinate-campanulate, 10-striate, 5-toothed; the teeth ovate, obtuse, conspicuously imbricated. Stamens about 10; the filaments inserted into a crenulate glandular ring at the summit of the calyx-tube. Ovary obovate, compressed, with 2 collateral suspended ovules. Very different in appearance from *A. fasciculata*, and destitute of the fleshy glands with which the throat of the calyx-tube is furnished in that species.

Photinia arbutifolia, *Linn.* Cordilleras of California. A shrub 4 or 5 feet high.

LYTHRACEÆ.

Lythrum alatum, *Pursh.* On the Arkansas.

ONAGRACEÆ.

Zauschneria Californica, *Presl.* Valley of the Gila. A shrub with bright crimson flowers, resembling those of a Fuchsia.

Œnothera albicaulis, *Nutt.* Valley of the Del Norte.

Œ. pinnatafida, *Nutt.* Tributaries of the Canadian river.

Œ. biennis, *Linn.* Valley of the Del Norte.

Several other undetermined species of Œnothera exist in the collection.

Gaura coccinea, *Nutt.* Tributaries of the Canadian.

G. parviflora, *Dougl.* Valley of the Del Norte.

LOASACEÆ.

Mentzelia pumila, *Nutt.* Stem whitish, slender, branching, and a little roughened above, smoothish and somewhat shining below; leaves pinnatifid, or sinuate-toothed; flowers (small) 2-3 together, pedicellate; petals 10, lanceolate; stamens very numerous; the outer filaments dilated; capsule turbinate-cylindrical; seeds numerous, winged. Valley of the Del Norte. Plant about a foot high. Flowers less than an inch in diameter. Capsule three-fourths of an inch long, 3-valved at the summit.

Cevalia sinuata, *Lagasca.* This interesting plant, which has been admirably illustrated by Fenzl, occurs in many parts of the valley of the Del Norte, from Santa Fé to Saltillo.

CUCURBITACEÆ.

Cucumis, perennis, *James, Torr, and Gr.* On the Gila river, abundant. We are yet uncertain of the genus of this plant, which seems to be common in various parts of Mexico, particularly in arid, sandy wastes. No specimens of the fruit have yet been sent to us. There are three other undetermined Cucurbitaceæ in the collection, distinct from any described in the Flora of North America.

CACTACEÆ.

Several interesting plants of this family were noticed by Colonel Emory, but they cannot be satisfactorily described from dried specimens. They are probably included among the numerous new species of Mexican Cactaceæ soon to be described by Dr. Englemann.

CORNACEÆ.

Cornus paniculata, *l'Her.* On the Arkansas.

CAPRIFOLIACEÆ.

Symphoricarpus racemosus, *Linn.* (Snow berry.) On the Arkansas.

COMPOSITAE.

Vernonia fasciculata, *Michx.* Bent's fort.

Liatris punctata, *Hook.* Rayada creek.

Corethrogyne tomentella, *Torr. and Gr. fl. N. Am. 2, p. 99.* Very abundant on the Cordilleras of the Pacific, and called by the natives *estafiat*. It is a celebrated remedy for cholera, as noticed by Colonel Emory in his report.

DIETERIA INCANA, *Torr. and Gr.? Diplopappus incanus, Lindl.?* On the Gila. Differs from Douglas's Californian plant in its slender stem, and nearly glabrous, spinulose dentate leaves.

D. CORONOPIFOLIA, *Nutt.* Valley of the Del Norte, and the head waters of the Canadian.

D. ASTEROIDES, *n. sp.* Minutely scabrous, pubescent, stem paniculately branched above; leaves oblong-cuneate, somewhat rigid, sharply and rather coarsely toothed, involucre hemispherical; scales linear, in several series, with rather short herbaceous squarrose tips; rays 30 or more, violet; achenia sparingly pubescent. Pappus of the ray much shorter than that of the disk. Elevated land between the Del Norte and the waters of the Gila. A well marked species, with leaves broader than in any other plant of the genus.

ASTER HEBECLADUS, *DC.* Valley of the Del Norte, and desert between the Colorado and Cordilleras of California.

A. (TRIPOLIUM.) A branching species, with the stems pubescent above, and middle sized flowers with purple rays. It seems to be undescribed. Valley of the Del Norte.

SOLIDAGO ELONGATA, *Nutt.* Valley of the Gila.

LINOSYRIS GRAVEOLENS, *Torr. and Gr. Chrysocoma dracunculoides, Pursh.* A shrub about two feet high, and bright yellow heads of flowers. Abundant on the highlands between the Del Norte and the Gila.

APLOPAPPUS SPINULOSUS, *DC.* On Ocaté creek, &c.: called *Pinette* by the natives.

A. MENZIESII, *Torr. and Gr. β. dentatus:* leaves coriaceous, strongly dentate or pinnatifid, toothed, glutinous. Abundant in the great desert between the Colorado and the Cordilleras of California. Another form of this species was found near St. Diego, with the stem and the leaves clothed with a copious loose pubescence, and the serratures of the leaves few and small.

GRINDELIA. An apparently new species of this genus was found in ascending the Cordilleras of California, but the flowers had fallen from the heads, and our specimen is therefore scarcely sufficient for determination. The stem is very smooth and whitish; the leaves are oblong, clasping at the base, spinulose, serrate and glabrous, and the scales of the involucre are very acute, but scarcely recurved.

CHRYSOPSIS CANESCENS, *Torr. and Gr.* Near Ocaté creek.

C. ECHOIDES, *Benth. in Bot. Sulph. p.* 25. Valley of the Gila.

PERITYLE, *Benth. in Bot. Sulph.* A new species of this genus (*P. Emoryi, nob.*) was found in ascending the Cordilleras of California. It differs from P. Californica of Bentham in its smaller and much more deeply lobed leaves, narrower achenia, which are very hairy on the margins, and in other characters.

BACCHARIS DOUGLASII, *DC.* Valley of the Gila. Besides this there are three other species of Baccharis in the collection, none of which are described in the Flora of North America, but we cannot yet pronounce them new.

TESSARIA BOREALIS, *DC.* An aromatic shrub about three feet high, growing in all the deserted beds of the Gila, and in the valley of the Del Norte; usually with the Frémontia, both of which are abundant in those regions.

HYMENOCLEA, *Torr. and Gr. ined.* This remarkable new genus is allied to Ambrosia and Xanthium. Another species of it (*H. Salsola*) was found in Frémont's second expedition, which, with the characters of the genus to which it belongs, will be published in another work. This species, from the scales of the involucre being in a single whorl, we propose to call *H. monogyra, Torr. and Gr.* It was found in various parts of the valley of the Gila.

FRANSERIA HOOKERIANA, *Nutt.* (Yerba del Sapa.)

AMBROSIA ACANTHOCARPA, *Hooker.* Very abundant from Santa Fé to the 33d parallel of latitude.

Another species of this genus, and apparently an undescribed one, exists in the collection. It is suffrutescent, hoary, with the leaves bipinnatifidly divided into very small obtuse segments. The flowers are wanting.

AMBROSIA ARTEMISIÆFOLIA, *Linn.* Bank of the Gila.

DICORIS, *Torr. and Gr.* Another new genus allied to Iva, of which a full description and figure will hereafter be given. It was found in the valley of the Gila, and in the desert of drifting sands west of the Colorado. (5 to 6 inches long, and 4 to 5 wide.)

WYETHIA OVATA, *n. sp., Torr. and Gr., ined.* Stem very stout, leaves orbicular, ovate, entire; somewhat coriaceous, pubescent, (as are also the petioles and branches;) scales of the involucre lanceolate; pappus of 3 to 4 acute rigid teeth, one of which is longer than the others. Abundant on the western side of the Cordilleras of California.

SILPHIUM LACINIATUM, *Linn,* (Pilot weed.) On the Arkansas and its tributaries.

Another Silphium, with large ovate undivided leaves, was found on Cariso creek.

ENGELMANNIA PINNATIFIDA, *Torr. and Gr. fl. N. Am.* 2, *p.* 283. Tributaries of the Canadian.

LEPACHYS COLUMNARIS, *Torr. and Gr. Rudbeckia columnaris, Pursh.* The rays vary from being wholly yellow to entirely purplish brown. From the head waters of the Canadian to Santa Fé.

ENCELIA FARINOSA, *Gray ined.* An aromatic shrubby plant; exuding a yellowish resin from the branches. The leaves are ovate, softly pubescent, and hoary on both sides, with 3 to 5 prominent reticulated nerves underneath.

HELIANTHUS PETIOLARIS, *Nutt.* Upper part of the Arkansas, and valley of the Del Norte.

H. LENTICULARIS, *Dougl.* With the preceding.

COREOPSIS PALMATA, *Nutt.* Turkey creek.

SIMSIA. A rayless, and probably new species of this genus, was found in the bed of the Agua Caliente, November 28th. It is a branching shrub, and the slender bark of the irregular twigs is covered with a whitish, very scabrous pubescence. The leaves are scarcely an inch long, ovate, entire, obtuse, with short petioles, and scabrous on both sides. Chaff of the receptacle embracing the obovate achenium, the margin of which is furnished with long silky hairs.

Wulfia? Specimens of a plant with the floral characters of this genus, but with different foliage, were found in abundance on the higher grounds bordering the valley of the Gila. It also resembles Leighia, but is destitute of a pappus. Some of the genera, to which the plant is allied, will need revision before its place can be satisfactorily determined.

Ximenesia, *n. sp.?* Valley of the Del Norte, and along the Gila, September and October. This needs comparison with some of the Mexican species. It very nearly resembles *X. encelioides*, *Cavan.*

Riddellia, tagetina, *Nutt. Torr. and Gr. fl., N. Amer.* 2 *p.* 362. Valley of the Del Norte, about two hundred miles below Santa Fé. A beautiful plant with persistent flowers, first detected by Mr. Nuttall towards the sources of the Platte.

Baileya, *n. gen. Harv. and Gr., ined.* Two other species of this unpublished genus, dedicated to that profound observer of nature, Professor Bailey, of West Point, exist among the California plants collected by Coulter, and will soon be described by Mr. Harvey and Dr. Gray. This is distinguished from the others by its numerous ray-flowers, and is the *B. multiradiata*, *Harv. and Gr.* The whole plant is clothed with a woolly pubescence, and varies from a few inches to a foot or more in height. The leaves are somewhat pinnatately cut into several narrow segments. The heads are on long naked peduncles, and when the rays are fully expanded are more than an inch and a half in diameter. The rays are 40 or 50 in number, in two or more series, obovate-cuneate, of a bright orange yellow, and 7-nerved corolla of the disk-flowers with five short segments which are glandulary pubescent, with intra-marginal nerves. Branches of the style short, somewhat dilated and truncate at the extremity. Very abundant along the Del Norte and in the dividing region between the waters of the Del Norte and those of the Gila. Flowers from October 4th to November.

Zinnia grandiflora, *Nutt. in Amer. Phil. trans.* (*n. ser.*) 7, *p.* 348; *Torr. and Gray ft. N. Amer.* 2. *p.* 298. Valley of the Del Norte. This plant, which was first detected by Dr. James in Long's first expedition, is certainly frutescent at the base; in which respect it resembles the nearly allied *Z. linearis*, *Benth. plant Hartw.*, *No.* 47. This is the most humble species of the genus; being not more than six inches high. The stem is branching and rigid. The leaves are linear, sessile, and somewhat connate at the base, strongly 3 nerved, and glandularly punctate. Heads most solitary, at the summit of the branches, on short peduncles. Involucre ovoid-cylindrical; the scales about 8, closely imbricated; outer ones somewhat orbicular; the inner oblong, ciliate, and somewhat scarious on the margin. Ray flowers 3 5, coriaceous and persistent, roundish-ovate, emarginate, continuous with the summit of the achenium. Disk-flowers few. Lobes of the corolla villous. Anthers yellow. Branches of the style tapering into a subulate-lanceolate point, hairy above the middle. Achenia obcompressed, scarcely winged, scabrous; the outer integument thin; those of the ray naked, of the disk with a single awn.

GAILLARDIA AMBLYODON, *Gay*. On the upper part of the Arkansas. This species has been beautifully figured by Dr. Gray in *Mem. Amer. acad.* (*n. ser.*) *t.* 4.

G. PULCHELLA, *Foug*. Valley of the Del Norte.

PALAFOXIA LINEARIS, *Lag*. New Mexico.

HYMENOXYS ODORATA, *DC*. Great desert west of the Colorado.

ARTEMISIA FILIFOLIA, *Torr. in Ann. lyc. N. York*, 2 *p*. 211. Valley of the Del Norte, and along the Gila; abundant.

A. DRACUNCULOIDES, *Pursh*. Table lands of the Del Norte and Gila. A very common species of underwood, often called *sage* by the hunters.

A. CANA, *Pursh*. On the Raton mountains.

SENECIO LONGILOBUS. *Benth. in pl. Hartweg*. A bushy species about three feet high, growing abundantly in the region between the waters of the Del Norte and the Gila.

TETRADYMIA, (sub-genus Polydymia.) Heads about 16-flowered; the flowers all tubular and perfect. Involucre of 15 to 16 oblong obtuse coriaceo-chartaceous scales which are slightly concave but not carinate. Receptacle naked. Corolla with rather slender tube; the lobes short, ovate, erect, furnished with long villous hairs externally. Anthers included. Branches of the style tipped with a very short obtuse pubescent cone. Achenia oblong-turbinate, villous with short hairs. Pappus of numerous, somewhat rigid, denticulate bristles. A suffrutescent prostrate much branched plant, canescently and densely tomentose; the leaves broadly obovate, toothed, narrowed into a petiole. Heads on short peduncles, terminating the somewhat corymbose branches.

T. (POLYDYMIA) RAMOSISSIMA, *n. sp*. Hills bordering the Gila. Stem spreading, with very numerous matted branches. Leaves about three-fourths of an inch in length, the lamina broader than long, with 5-7 indistinct rounded teeth, abruptly narrowed into a longish petiole. Heads about one-third of an inch in diameter, ovate. Involucral scales in several series, the exterior ones shorter than the interior. Hairs of the achenium smooth, slightly bifid at the summit. Pappus longer than the achenium. This plant is clearly allied to Tetradymia, but differs in the many-flowered heads, numerous scales of the involucre, slightly cleft corolla-tube, and in several other characters; so that it should perhaps form the type of a distinct genus.

CIRSIUM UNDULATUM, *Spreng*. The locality of this plant is not recorded, but it was probably found on the upper part of the Arkansas.

STEPHANOMERIA PANICULATA, *Nutt*. Ascending the Cordilleras of California.

MULGEDIUM PULCHELLUM, *Nutt*. Pawnee Fork of the Arkansas.

ERICACEÆ.

Arctostaphylos pungens, *Kunth.?* Valley of the Gila and San Diego. Flowers in January.

A. tomentosa, *Dougl.?* A shrub 4 to 5 feet high. Cordilleras of California. This may be a smooth variety of Douglas's plant. The leaves are orbicular-ovate, obtuse or truncate at the base, glabrous on both sides, with the petiole one-third the length of the lamina. It was not found in flower.

PLANTAGINACEÆ.

Plantago, *n. sp.?* Allied to *P. gnaphaloides, Nutt.* Great desert west of the Colorado, near the Cordilleras of California. The whole plant is clothed with a loose white tomentum, which is partly decidious with age. The leaves are linear-lanceolate, entire, and taper to a long narrow base. The peduncles are 5 to 6 inches long, and bear a close cylindrical spike, which is less than an inch in length. Sepals ovate, membranaceous, marked with a strong mid-rib, which is villous externally. Segments of the corolla ovate. Capsule 2 seeded.

PEDALIACEÆ.

Martynia proboscidea, *Linn.?* Abundant in the valley of the Del Norte. We have only the leaves, and a drawing of the fruit. It is possibly *M. Althæfolia, Benth. in bot. Sulph.*

SCROPHULARIACEÆ.

Maurandia antirrhina, *Lindl.* On the San Francisco, a tributary of the Gila. A slender trailing plant, with beautiful purplish flowers.

Castilleja linearifolia, *Benth.* Valley of the Gila, and the region between that river and the waters of the Gila.

Penstemon Torreyi, *Benth.* Region between the Del Norte and the Gila.

Three or four other species of Penstemon exist in the collection, but the specimens are incomplete, and have not yet been studied.

VERBENACEÆ.

Verbena bipinnatifida, *Nutt.* Valley of the Del Norte.

Lippia cuneifolia, *Steud.* Verbena cuneifolia, *Torr.* in Long's Rocky Mountain plants. Upper part of the Arkansas, and along the tributaries of the Canadian.

LABIATÆ.

Salvia carduacea, *Benth.* Western slope of the Cordilleras of California.

Another species of this genus was found with the preceding, but not in flower. It is entirely clothed with dense soft canescent pubescence. It is shrubby, with long stout branches springing from near the root. The leaves are oblong, coriaceous, entire, and two inches or more in length.

Several other undetermined Labiatæ were found in the valley of the Del Norte and on the Gila.

BORAGINACEÆ.

Myosotis glomerata, *Nutt.* Tributaries of the Canadian.

Euploca grandiflora, *n. sp.* Hirsute with rough oppressed hairs. Leaves oblong-lanceolate, on short petioles. Flowers in leafy clusters. Calyx five-parted to the base, with linear-lanceolate segments. Corolla white; (the expanded limb nearly three-fourths of an inch in diameter,) obscurely 5-lobed, plaited; tube slender, somewhat ventricose below the middle; the throat naked. Stamens inserted towards the base of the corolla-tube; the filaments short; anthers oblong-linear. Ovary 4-celled, style filiform, persistent, arising from the summit of the ovary; stigma capitate, with a tuft of stiff hairs at the extremity. Fruit 4-celled, 2-lobed, finally separating into indehiscent carpels; embryo curved, terete, surrounded with very thin albumen; radicle superior. On the Del Norte below Santa Fé. This plant is clearly a congener of *Euploca convolvulacea* of Nuttall. It is nearly related to Tournefortia.

HYDROLEACEÆ.

Eriodictyon, *Benth. in bot. Sulph.*, *p.* 35. *Chois. in DC, prod.* 10, *p.* 183. A well characterized Californian genus, containing three described species, one of which, the *Wigandia Californica*, *Hook. and Arn.*, was found in rocky places near the mouth of San Carlos, on the Gila, and on the Cordilleras of California. The leaves are coriaceous, varying in form from narrowly linear to lanceolate, and from being perfectly entire to strongly dentate. The upper surface (as well as the branches) is covered with a copious adhesive varnish, while the under-side is whitish tomentose, with strongly marked reticulated veins.

POLEMONIACEÆ.

Phlox, *n. sp.* This likewise occurs in Texas, and will be described by Dr. Gray. It was found in various places on the tributaries of the Canadian.

Gilia pulchella, *Dougl.* Ocaté creek, and other tributaries of the Canadian.

G. longifolia, *Benth.* Ipomœa longifolia, *Torr.* in Long's Rocky mountain plants. Valley of the Del Norte.

Fouquiera spinosa. (*Bronnia spinosa, Kunth. nov. gen.* 6 *p.* 84, *t.* 528.) *Benth. in Bot. Sulph. p.* 16. Ascending the Cordilleras of California. A highly ornamental shrub, shooting up long smooth simple stems, to the height of from 12 to 25 feet, with a panicle of scarlet flowers near the summit. It differs slightly from the figure and description of Kunth, but seems to be the same plant. The leaves are obovate-oblong, glabrous and membranaceous, growing in fascicles in the axils of the spines. The spines are from a half an inch to near an inch in length, slender, more or less spreading, or even somewhat recurved. At the base of each is a longitudinal protuberance which extends along the stem until it reaches the spine, which is on a line with it below. The panicle is usually contracted and elongated, but sometimes short, and almost corymbose. The flowers are on short pedicles which are furnished with deciduous bracts. Sepals 5, nearly orbicular, concave, strongly imbricated, persistent, about one-fourth the length of the corolla. Corrola about three-fourths of an inch long; the tube cylindrical, and often curved; limb 5-cleft, with ovate rather acute segments. Stamens 13 to 16 exserted, hypogynous; the filaments thickened and somewhat coherent at the base; anthers linear-oblong, mucronate. Ovary 3-celled, with about 6 ascending anatropous ovules in each cell; style 3-parted below the middle. Capsule oblong, acute, obtuse, triangular, coriaceous and glabrous, 3-valved, loculicidal, straight, or little curved, 1-celled by the separation of the valves from the triangular axis. Seeds 3 to 6, white, ovate, peltate, much compressed, with a broad winged margin, which is an expansion of the testa, and which finally is resolved into numerous fine hairs. These are beautiful objects under the microscope. They are spiral vessels consisting of an extremely delicate sheath, containing the loosely coiled thread which frequently ramifies with anastomosing branches. The whole testa is formed of these singular vessels. Embryo nearly as large as the seed; cotyledons foliaceous; radicle pointing downward. There can be little doubt of the propriety of uniting Bronnia and Fouquiera. Each genus was founded on a single species, and both plants seem to be very little known to European botanists. Of the former the flowers are imperfectly described, and of the latter the fruit is unknown. Our plant partakes of the characters of both genera. In the ovary the placentæ meet in the axis, but only slightly cohere; finally they unite, but in fruit the valves of the capsule separate from the axis, to which the seeds remain attached. As to the affinities of Fouquiera, I am inclined to adopt the opinion of Lindley, that it is very near Polemoniaceæ, and particularly to Cantua. It differs, however, in its distinct imbricated sepals, (which are exactly those of convolvulus,) more numerous and hypogynous stamens; and very sparing albumen, as well as in habit. It is certainly very unlike Frankeniaceæ, to which it is appended by Endlicher. Kunth placed it among genera allied to Portulacaceæ.

CONVOLVULACEÆ.

Ipomœa leptophylla, *Torr. in Frém. 1st report, p.* 94. Upper part of the Arkansas and head waters of the Canadian. The stems are often erect, about two feet high, and of a bushy appearance.

From the appearance of the specimens, I should suppose the plant were a perennial, but according to Dr. James it is an annual.

CONVOLVULUS NUTTALLII. C. HASTATUS, *Nutt. in trans. Amer. phil. soc. (n. ser.)* 5 *p.* 194; *not of Thunb.* Valley of the Del Norte.

One or two other Convolvulaceæ were in the collection, but I have not determined them to my satisfaction.

SOLANACEÆ.

NYCTERIUM LOBATUM. Between Fort Leavenworth and the head of the Arkansas.

DATURA METEL, *Willd?* Valley of the Gila. It grows from four to five feet high, with spreading branches. Perhaps introduced.

SOLANUM TRIFLORUM, *Nutt.* Upper part of the Arkansas, and on the tributaries of the Arkansas.

Another species of Solanum was found on the Del Norte below Santa Fé. The whole plant is clothed with a dense yellowish white pubescence. The stems are rough, with minute slender prickles. Leaves linear-oblong, entire, rather obtuse, prickly along the midrib. Flowers, two or three together at the summit of the branches, white? stamens 5; anthers equal.

GENTIANACEÆ.

EUSTOMA RUSSELIANUM, *Don.* Near the bank of the San Pedro. A showy plant.

ERYTHRÆA BEYRICHII, *Torr. and Gr. E. tricantha β Griseb.* Valley of the Del Norte, and along the Gila.

OLEACEÆ.

FRAXINUS VELUTINA, *n. sp.* Branches, petioles, and under surface of the leaves, clothed with a dense soft pubescence. Leaflets 3 to 5, rhombic-ovate, cuneate at the base, coarsely serrate or toothed, sparingly pubescent above. Fruit narrowly oblanceolate, nearly entire at the apex, about three-fourths of an inch long. A small tree, usually from 15 to 20 feet high. Grows in the region between the waters of the Del Norte and the Gila; also on the Mimbres, a tributary of the latter river.

NYCTAGINACEÆ.

ABRONIA MELLIFERA, *Hook.* Valley of the Del Norte.

A. (*Tripterocalyx*) MICRANTHUM, *Torr. in Frém. 1st report, p.* 96. Valley of the Del Norte.

This differs in some respects from Frémont's plant. The peduncles are elongated, and the fruit is more than an inch long, with very broad wings. The structure of the seed is precisely the same as in that plant, the inner cotyledon of the conduplicate embryo being abortive. It is wanting also in A. mellifera. In several species of this genus, if not in all of them, the filaments adhere throughout nearly their whole length to the tube of the perianth. The lobes of the perianth are dilated, and deeply emarginate, but appear ovate in the bud, from the lobules being conduplicate.

CHENOPODIACEÆ.

Sarcobatus vermiculatus. *S. Maximilioni, Nees in Prince Max. im. Trav., Engl. ed., p.* 518. *Frémontia vermicularis, Torr. in Frém. 1st report, p.* 96; *and 2d report, p.* 317. *Batis vermicularis, Hook. fl. Bor. Am.* 2, *p.* 188. Abundant on the Del Norte, and upper part of the valley of the Gila.

This is the *pulpy thorn* of Lewis and Clark. It has a very extensive range in the desert regions on both sides of the mountains. Since my notices of this plant were published in Frémont's reports, I have ascertained that Nees' description of his genus Sarcobatus dates a little anterior to mine, so that his name must be adopted.

Obione argentea, *Moq. Atriplex argentea, Nutt.* Abundant in sandy saline places on the Del Norte.

O. polycarpa, *n. sp.* Valley of the Gila.

Eurotia lanata, *Moq.* Valley of the Del Norte. A shrubby Salicornia, an Atriplex, and a species of Sueda, were found in saline soils along the Gila.

AMARANTHACEÆ.

Amaranthus hybridus, *Var.*? Glabrous; stem and leaves nearly smooth, flowers (purplish) crowded in a dense compound terminal spike; bracts somewhat awned, shorter than the flowers; utricle opening transversely. On the Del Norte, below Santa Fé.

Alternanthera? (Endotheca) lanuginosa.—Achyranthes lanuginosa, *Nutt.* in *Am. Phil. Trans.*, (*N. Ser.*,) 5, *p.* 166. Abundant on the sand hills above Socoro, along the Rio Del Norte. It spreads on the ground, forming patches, and rooting at the joints. The natives call it *paga-paga.* Nuttall referred this plant to Achyranthes, but it is clearly not of that genus. For the present, it is doubtfully placed in Alternanthera, but may hereafter be separated as a distinct genus. The flowers are in small axillary sessile clusters, and when the fruit is matured, they become imbedded in the branches by the growth of the surrounding parts, so as to be entirely concealed. The filaments are united into a cup at the base, and leave minute, entire, intermediate teeth. The anthers are two-celled before dehiscing, but afterwards one-celled, ovary, with a single ovule; style almost wanting; stigma globose. This plant was first discovered by Nuttall, on the north fork of the Canadian; Colonel Frémont collected it on the upper Arkansas in his last expedition; it has also been found in Texas by Mr. Wright and by Fendler and Dr. Gregg in New Mexico.

POLYGONACEÆ.

Eriogonum trichopes, *n. sp.* Stem scape-like, verticillately and divaricately much branched, glabrous; peduncles capillary; involucre minute, few-flowered, glabrous, 4-toothed; the teeth nearly equal, obtuse, erect; sepals ovate, acute, nearly equal, very hairy. Eastern slope of the Cordilleras of California. Our specimens of this remarkable species are imperfect, the leaves being wanting. They probably grow in a radical cluster. The flowering stems are a foot or more high, with the primary and secondary branches verticillate; the branchlets are bi-trichotomous, and the ultimate divisions or peduncles somewhat secund. Involucre scarcely half a line in length, 5—6 flowered, and only 4-toothed. The flowers are nearly twice as large as the involucres, sepals, concave, erect—spreading. Stamens scarcely exserted.

E. tomentosum, *Michx.* Abundant in the region between the valley of the Del Norte and the waters of the Gila; the most western station hitherto found of this species, which is almost the only Eriogonum known east of the Mississippi.

E. Abertianum, *n. sp.* Annual? Canescently tomentose; stem dichotomous above; leaves oblong-lanceolate, attenuated to a petiole at the base; involucres solitary, somewhat racemose on the branches, pedunculate, many flowered, campanulate, deeply 5—8-parted; exterior sepals nearly orbicular, deeply cordate at the base; inner sepals narrow, carinate below, contracted above, somewhat dilated and emarginate at the summit; stamens much shorter than the sepals. Very common in the region between the Del Norte and the Gila. Also found by Lieut. Abert on the upper waters of the Arkansas. Just as I was sending these notes to the press, I received a visit from Mr. Nuttall, who informed me that a species allied to this was found by Mr. Gambel, in his late journey to California. He thinks its characters differ so much from all the Eriogono hitherto described, that he has constituted of it a new genus under the name of Eucycla. A full account of Mr. Gambel's plants, by Mr. Nuttall, will soon be published in the journal of the academy of Philadelphia. Our plant is about a foot high, with loosely paniculate branches. The heads and flowers are nearly as large as those of *E. tomentosum*. The sepals are yellowish, tinged with rose, the three inner ones differ widely from the others; they are carinate and glandular on the back below the middle, and closely embrace the pistil, the angles of which correspond with the keels of the sepals.

Imperfect specimens of several other Eriogona occur in the collection.

SAURURACEÆ.

Anemopsis Californica, *Nutt. Hook. in bot. Beechey's Voy.*, *p.* 390, *t.* 92. Valley of the Gila.

EUPHORBIACEÆ.

Eremocarpus setigerus, *Benth. in Bot. of Sulph.*, *p.* 53, *t.* 26. Plains of San Diego, California.

Hendecandra Texénsis, *Klotzsch. H. multiflora*, *Torr. in Frem. 1st report. Croton muricatum*, *Nutt.* Valley of the Del Norte.

Another species of this genus, allied to *H. procumbens*, was found on the Cordilleras of Mexico, but the materials are scarcely sufficient for determining it satisfactorily.

Stillingia spinulosa, *n. sp.* Suffruticose? leaves rhombic-ovate, rigid, narrowed at the base, prominently 3-nerved, mucronately acuminate, dentate spinulose on the margin; spikes axillary and terminal; sterile flowers sessile; bracts acuminate, with a stipitate gland on each side at the base. Abundant in the desert west of the Colorado. Stem (apparently) about a span high, with spreading branches. Leaves an inch or more in length, sessile, neatly margined with spreading spinulous teeth, glabrous on both sides. Spikes numerous; with solitary fertile flowers at the base. Sterile flowers about as long as the scale. Perianth hemispherical, irregularly lobed and undulated. Stamens 2. Fertile flowers imperfect in our specimens. Fruit glabrous.

Euphorbia herniaroides, *Nutt.* Banks of the Gila. A pubescent variety of this species was found in the desert west of the Colorado.

CUPULIFERÆ.

Quercus Emoryi, *n. sp.* Leaves coriaceous, oblong, on very short petioles, remotely and repandly toothed, the serratures mucronate, smooth on both sides; fruit pedunculate, solitary and in pairs, gland ovoid-oblong, mucronate; cup hemispherical, the scales appressed. Common in the elevated country between the Del Norte and the Gila. This small-leaved oak resembles *Q. agrifolia* and *Q. undulata*, (*Torr. in Ann. lyc. N. York* 2, *p.* 248, *t.* 4,) but is quite distinct from both.

SALICACEÆ.

Salix. Several narrow-leaved willows were found along the Gila, and in the region west of the Colorado; but being without fructification they cannot be determined. One of them is used as food for cattle when there is no grass.

PLATANACEÆ.

Platanus Mexicanus, *Moricand pl. nouv. ou rares d'Amer. t.* 26. *P. Californicus*, *Benth. bot. Sulph.*, *p.* 54. *P. racemosus*, *Nutt.?* Valley of the Gila.

CONIFERÆ.

Ephedra occidentalis, *Willd.?* From the region between the Del Norte and the Gila, and the hills bordering the latter river to the desert west of the Colorado. A shrub 3-4 feet high, with numerous slender branches; its appearance being that of Scotch broom, (Spartium scoparium.) The sheaths are very long, 3-parted, with subulate-acuminate segments. This can hardly be the *E. Americana* of Quito, which is described as having 2-parted sheaths. The specimens are without either flowers or fruit. If the species should prove to be new, it may be called E. trifurcus. There seems to be still another species growing on the table lands of New Mexico, differing from the preceding in its very short sheaths.

Juniperus. Two undetermined species were found in crossing the country from the Del Norte to the Gila. Both of them have the general character of *J. Virginiana*. One is a large tree, with acerose leaves, and a bark like that of a Pinus; the other has short closely appressed leaves, and berries larger than a buck shot.

AMARYLLIDACEÆ.

Agave Americana, *Linn.* Found in descending the western slope of the Cordilleras of California. This is the *maguey* of the Mexicans. It shoots up a flowering stalk 10 or 15 feet high. The juice of the plant affords an intoxicating drink called *pulque*.

Another species of Agave, or a very remarkable variety of the preceding was found in New Mexico, west of the Del Norte. It differs from *A. Americana* in its much shorter and broader leaves, which are furnished with smaller marginal spines.

LILIACEÆ.

Yucca. The leaves only, of what appear to be four species of this genus, occur in the collection, but we cannot identify them for want of the inflorescence.

ORCHIDACEÆ.

Spiranthes cernua, *Rich.* Low grounds in the valley of the Del Norte.

CYPERACEÆ.

Eleocharis quadrangulata, *R. Brown.* Valley of the Gila.

Cyperus Michauxianus, *Schultes.* Valley of the Gila.

GRAMINEÆ.

Chloris alba, *Presl.* Spikes umbellate-fasciculate, numerous, (8—12,) the peduncle enclosed in a broad compressed sheath; spikelets 2-flowered; upper glume nearly as long as the flowers, 2-toothed, with a short awn between the teeth; lower palea of the perfect flower obscurely 3-nerved, gibbous in the middle, the margin ciliate with long hairs towards the summit; awn three times as long as the palea; neuter flower broad and truncate, inclosing a short aristiform rudiment; the awn twice as long as the palea. Bed of the Gila. Very near *C. barbata*, which differs in the entire glumes, entire mucronate, (not awned,) in the entire straight lower palea of the perfect flower, and in the third or aristiform flower being much exserted.

BOUTELOUA RACEMOSA, *Lagasca.?* Culm erect, simple; spikes numerous (20—40,) reflexed, 3-flowers; lower glume linear subulate; upper one linear-lanceolate, scabrous, entire, nearly as long as the spikelets; lower palea of the perfect flower unequally tricuspidate, pubescent; abortive flower reduced to a slender awn which is nearly as long as the perfect flower, furnished at the base with 2 short and inconspicuous bristles. Valley of the Gila, rare. This plant agress pretty well with Kunth's description of *B.* (*Eutriana,*) *racemosa*, except in the pubescent lower palea, and the minute bristles at the base of the neuter flower. Whether it be the plant of Lagasca or not is very difficult to determine from his brief character. It certainly is very different from *B. racemosa* of the United States, which has a large 3-awned neuter flower, and if distinct from Lagasca's, must receive another name. That of *B. curtipendula* would be appropriate.

CHONDROSIUM ERIOPODUM, *n. sp.* Culm simple, pubescent below; spikes 4—6, racemose, appressed, on short woolly peduncles; spikelets 2-flowered; flowers distichous; glumes very unequal, glabrous, linear-lanceolate, mucronate, entire; lower palea of the perfect flower glabrous, bifid at the apex, with a short bristle between the teeth; neuter flower pedicellate, with 3 slender awns. This is one of the species of "Grama" so useful as a fodder-grass in New Mexico. It is abundant along the Del Norte, and in the region between that river and waters of the Gila. The culm is slender, a foot or more in height. Leaves are very narrow, 2—3 inches long, with glabrous sheaths; sheath almost wanting. Spikes about three-fourths of an inch long.

CHONDROSIUM FŒNEUM, *n. sp.* Leaves glabrous; spikes 2—3, oblong, falcate, spreading; rachis nearly half the length of the spikes; upper glume nearly as long at the perfect flower, with two rows of piliferous glands on the back; lower palea deeply 3-cleft, the segments lanceolate and mucronate, hairy on the margin; neuter flower of two truncate emarginate valves, with a 2-valved rudiment of a third flower, and 3 short stout awns. Uplands bordering the valley of the Del Norte. This is another of the grasses called *Grama* in New Mexico, and is the best kind, being almost as good fodder as oats. It is nearly allied to *Atheropogen* (*Chondrosium,*) *oligostachyum* of Nuttall.

CHONDROSIUM POLYSTACHYUM, *Benth. bot. Sulph. p.* 56. Uplands bordering the Gila. The smallest kind of "*Grama*" found on the journey. It is about 6 inches high, very slender. The spikes are narrowly linear, and almost half an inch long, erect, on short brownish peduncles. The other characters agree minutely with Mr. Bentham's admirable detailed description in the work quoted above.

LEPTOCHLOA FILIFORMIS, *Roem and Schults.* Valley of the Gila. Scarcely distinct from *L. mucronata* of the United States.

SESLERIA? DACTYLOIDES, *Nutt.* Upper part of the Arkansas. This is the celebrated "*Buffalo Grass*," so called because it constitutes the chief fodder of the wild buffalo, during the season that it flourishes. I have retained this plant, for the present, where it was placed by Mr. Nuttall, who noticed its anomalous characters. It differs from Sesleria, and indeed from the Tribe *Festucaceæ*, in its habit, which is that of Chondrosium. The stem throws off suckers which root at the joints, from whence leaves and culms of a few inches in height are thrown up. The spikes are two or three in number, on short spreading peduncles. They are oblong, about half an inch in length, and obtuse; bearing from 6 to 8 spikelets, which are unilateral, and form a double row on the rachis. The spikelets are usually 2 flowered, but I have occasionally found them with 3 flowers, and even the rudiment of a fourth. The glumes are very unequal oblong-ovate, coriaceo-membranaceous, carinate and one-nerved, the upper one slightly mucronate. Palea oblong-lanceolate and somewhat keeled, membranaceous, nearly equal, but longer than the glumes, entire, glabrous except on the keel; the lower 3 nerved, the upper bi-carinate. Anthers large, linear, fulvous. In all the specimens of this collection, as well as in those in my herbarium from numerous other localities, there are no fertile flowers, and only in few instances rudimentary styles, so that the plant seems to be diœcios polygamus by abortion.

Arundo Phragmites, *Linn.* Valley of the Del Norte, and along the Gila.

Andropogon argenteus, *DC.*, *Kunth. enum.* 1, *p.* 500. Valley of the Gila. A handsome species, with the spikes in a terminal panicle which has a white appearance from the abundant silky hairs of the flowers.

A. macrourus, *Michx.* With the preceeding.

Besides these grasses, there were a few others, mostly collected in the valley of the Gila, but which I have not determined, as the specimens were not so complete as could be desired. Among them are a *Glyceria*, two *Agrostides*, five species of *Panicum*, and a *Poa* (*Eragrostis*,) with large elongated spikelets. In some parts of the valley of the Del Norte, *Sorghum vulgare* is cultivated, and was found partly naturalized.

EQUISETACEÆ.

Equisetum hyemale, *Linn.* Lower part of the Colorado.

FILICES.

Adiantum tenerum, *Swartz.* Valley of the Gila. This species is widely spread over the southern part of North America, and yet has not hitherto obtained a place in our Flora. We have it from Alabama, Florida, Texas, and various parts of California.

Lycopodium. A small species allied to *L. rupestre*, was found in descending the Gila. It differs in its incurved leaves which are mucronate, but without a bristle at the tip. No fructification exists in the specimen.

EXPLANATION OF THE PLATES.

Plate 1—*Dalea formosa.*—A branch of the natural size, with a separate flower magnified

Plate 2—*Fallugia paradoxa.*—Natural size, with a separate carpel magnified.

Plate 3—*Larrea Mexicana.*—A branch of the natural size. Figure 1. Separate flower Figure 2. External view of a stamen, with a scale at its base. Figure 3. The same seen from the opposite side. Figure 4. Ovary and style. The last three figures magnified.

Plate 4—*Zinnia grandiflora.*—The entire plant, except the root. Figure 1. A head o flowers. Figure 2. A ray flower, natural size. Figure 3. A disk flower. Figure 4 Stamen. Figure 5. Portion of the style, with its branches. The last three figures mor or less magnified.

Plate 5—*Ridellia tagetina.*—A branch of the natural size. Figure 1. Achenium and pappus of a ray flower magnified. Figure 2. A ray flower less magnified. Figure 3. A disk flower. Figure 4. Part of the style, with its branches. The last two figures considerably magnified.

Plate 6—*Baileya multiradiata.*—The whole plant, except the lower portion of the stem Figure 1. A ray flower. Figure 2. A disk flower. Figure 3. Two of the stamens Figure 4. Style and its branches. All magnified.

Plate 7—*Arctostaphylos pungens.*

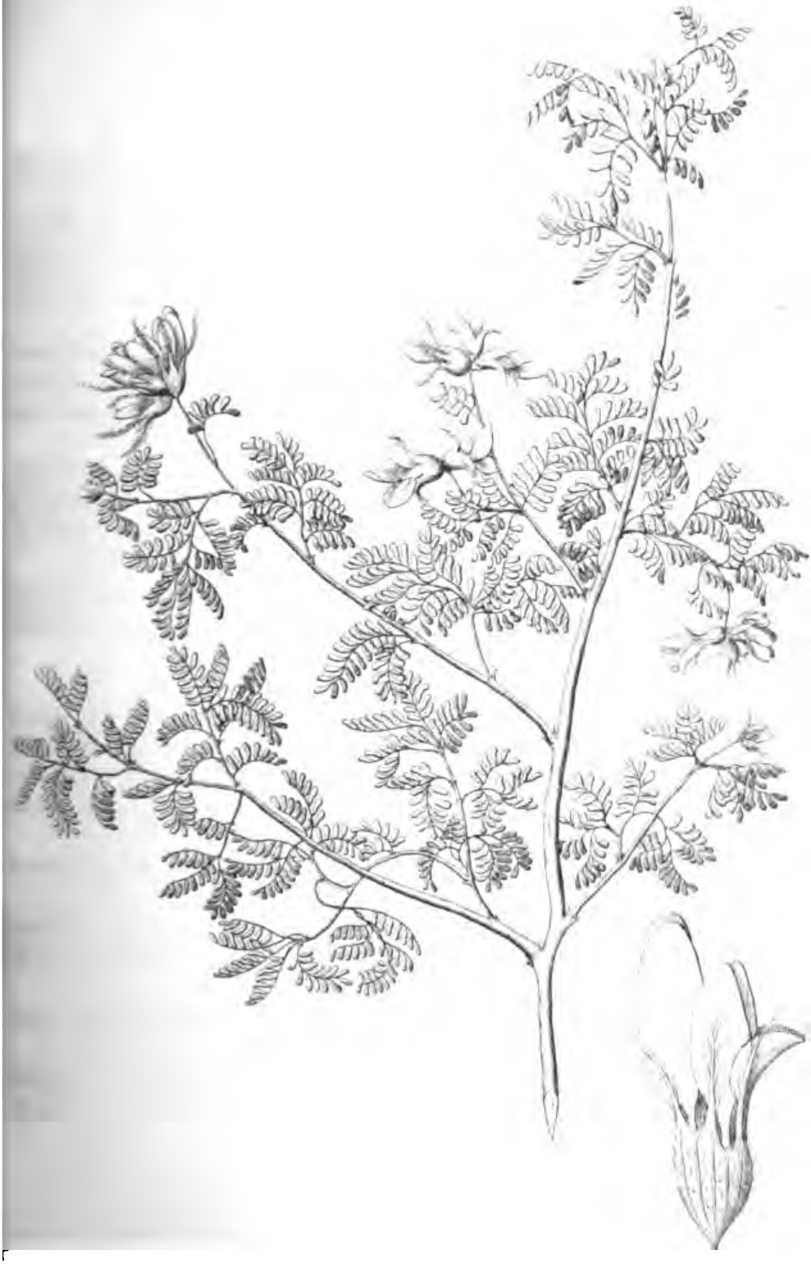
Plate 8—*Fouquiera spinosa.*—Summit of the stem and panicle of flowers. Figure 1. A capsule, with the valves separated, showing the placentiferous axis. Figure 2. A seed (Both of natural size.) Figure 3. Tranverse section of a seed. Figure 4. Embryo (The last two magnified.) Figures 5 and 6. Spiral vessels composing the testa of th seed, greatly magnified.

Plate 9—*Quercus Emoryi.*—Figures 1 and 2. Acorns of the same. All the figures o natural size.

Plate 10—*Sesleria dactyloides.*—The entire plant of the natural size. Figure 1. A spikelet. Figure 2. Glumes. Figure 3. Staminate flower. Figure 4. The same, with th paleæ removed. All the figures magnified.

Plate 11—*Ipomœa leptophylla.*—A branch of the natural size. Figure 1. Pistil. Figur 2. Capsule. Figure 3. Seed. All the figures of natural size.

Plate 12—*Chondrosium fœneum.*—Two plants of the natural size. Figure 1. A spikele magnified. Figure 2. The same, with the glumes removed, somewhat more highl magnified. Figure 3. Upper palea of the perfect flower.



DALEA FORMOSA.

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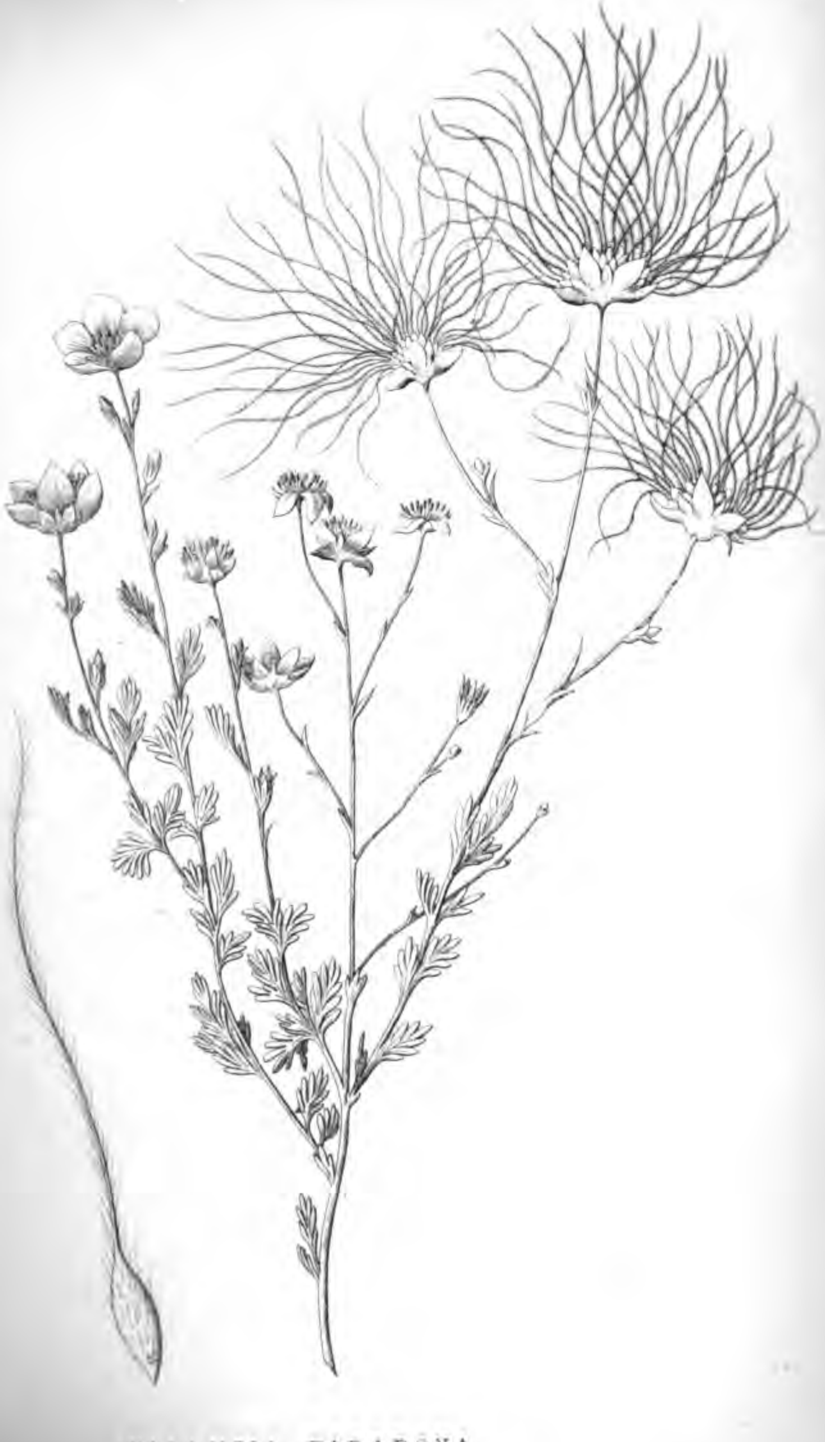

FALLUGIA PARADOXA.

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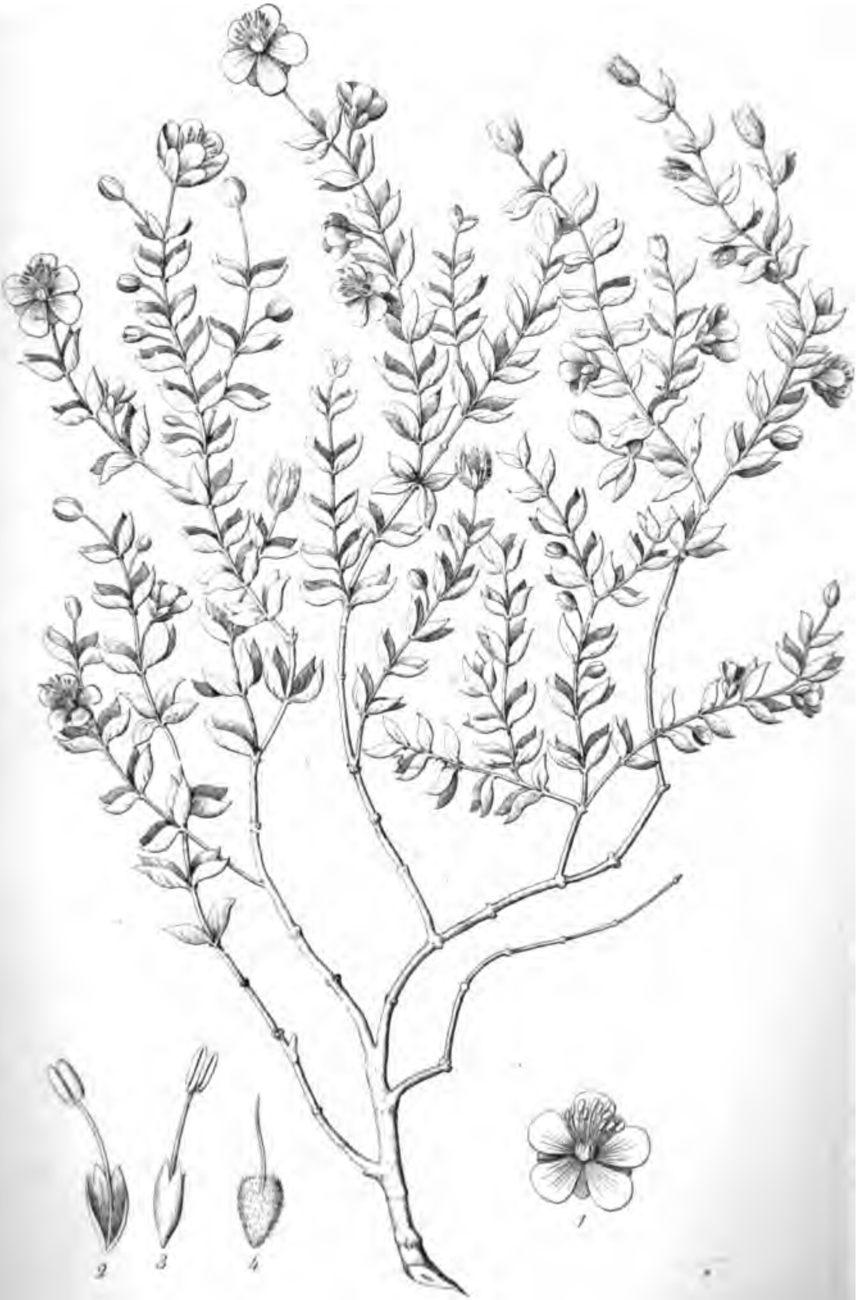

LARREA MEXICANA.

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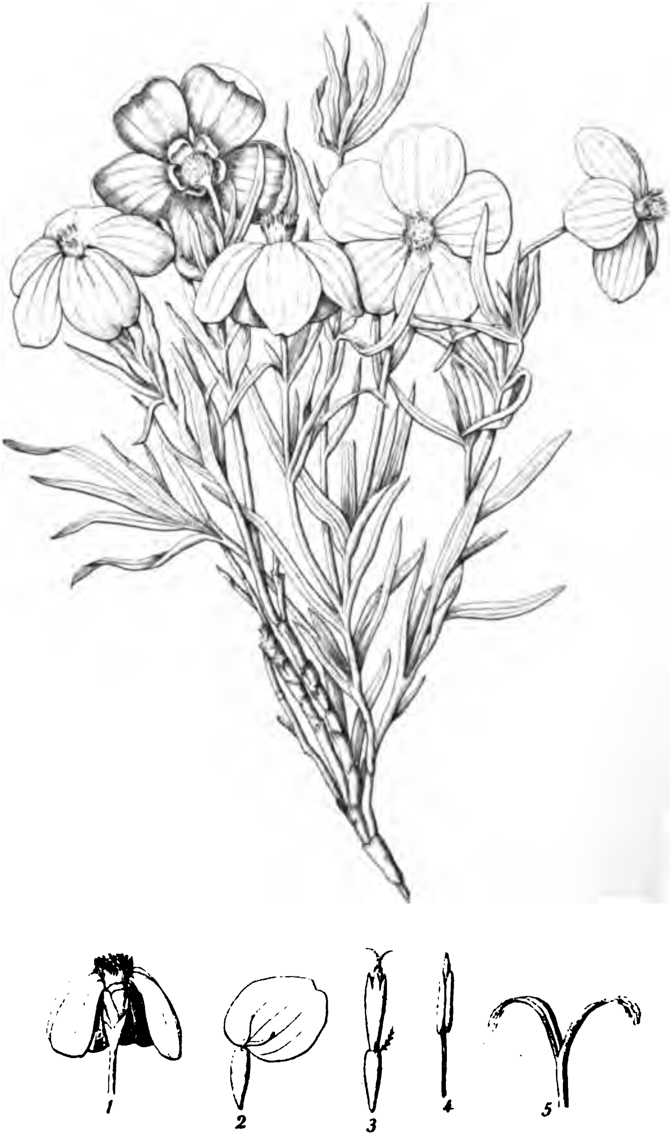
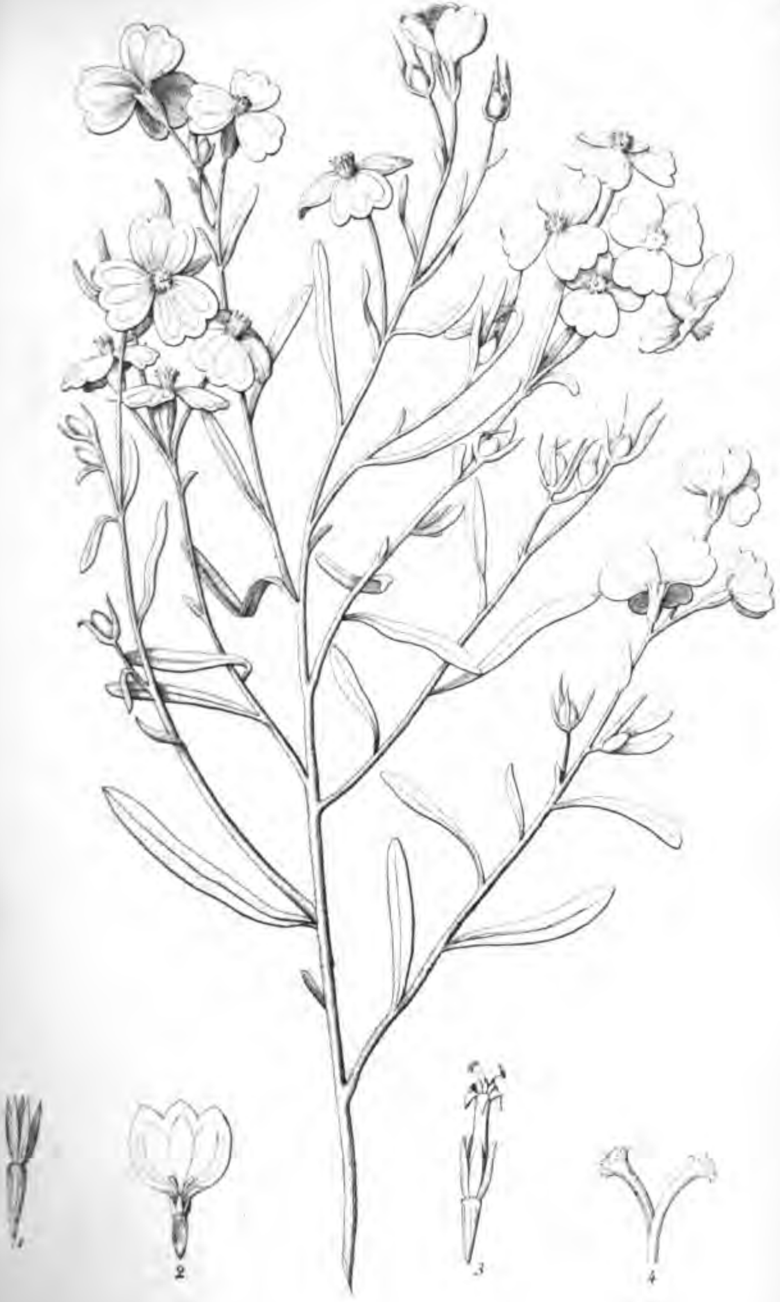
IV



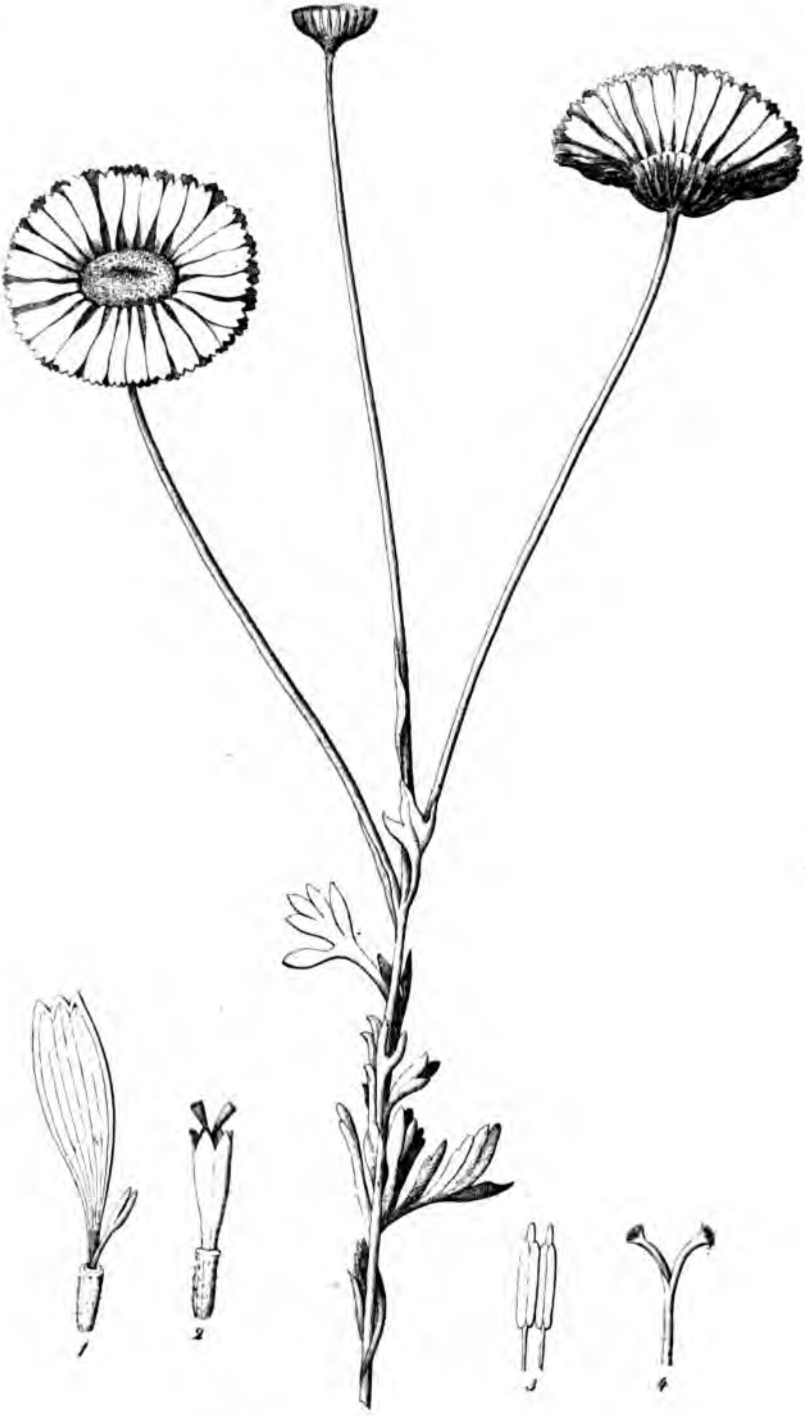
ZINNIA GRANDIFLORA.

V



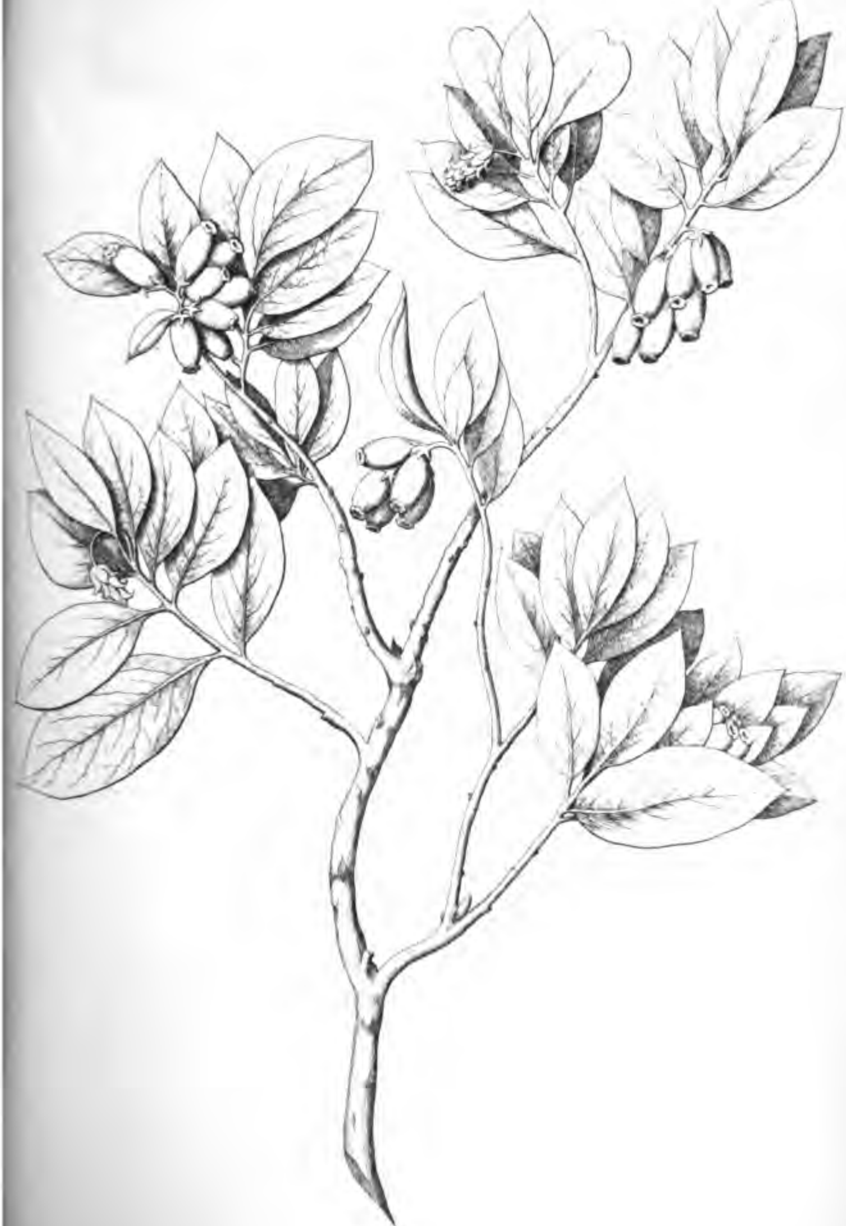
RIDDELLIA TAGETINA

Lith. by A. Weber & Co. Phil.



BAILEYA MULTIRADIATA

VII



ARCTOSTAPHYLOS PUNGENS.

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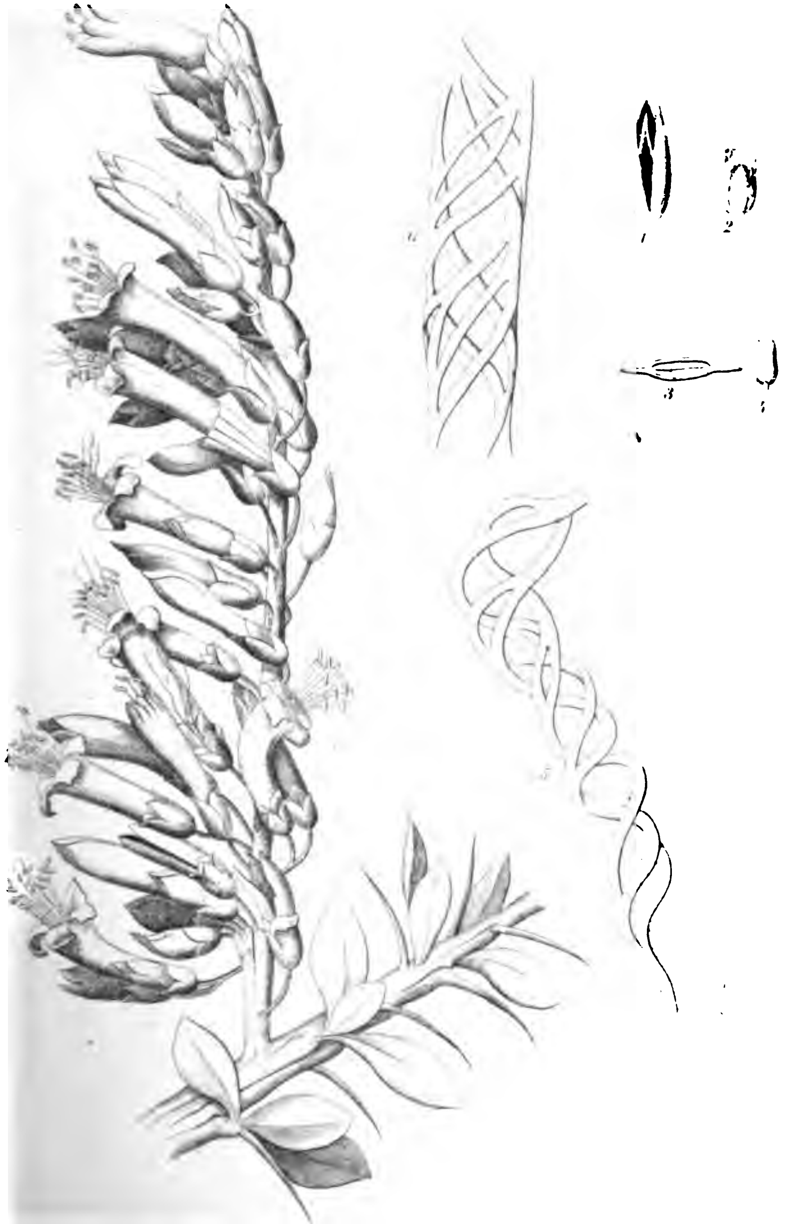
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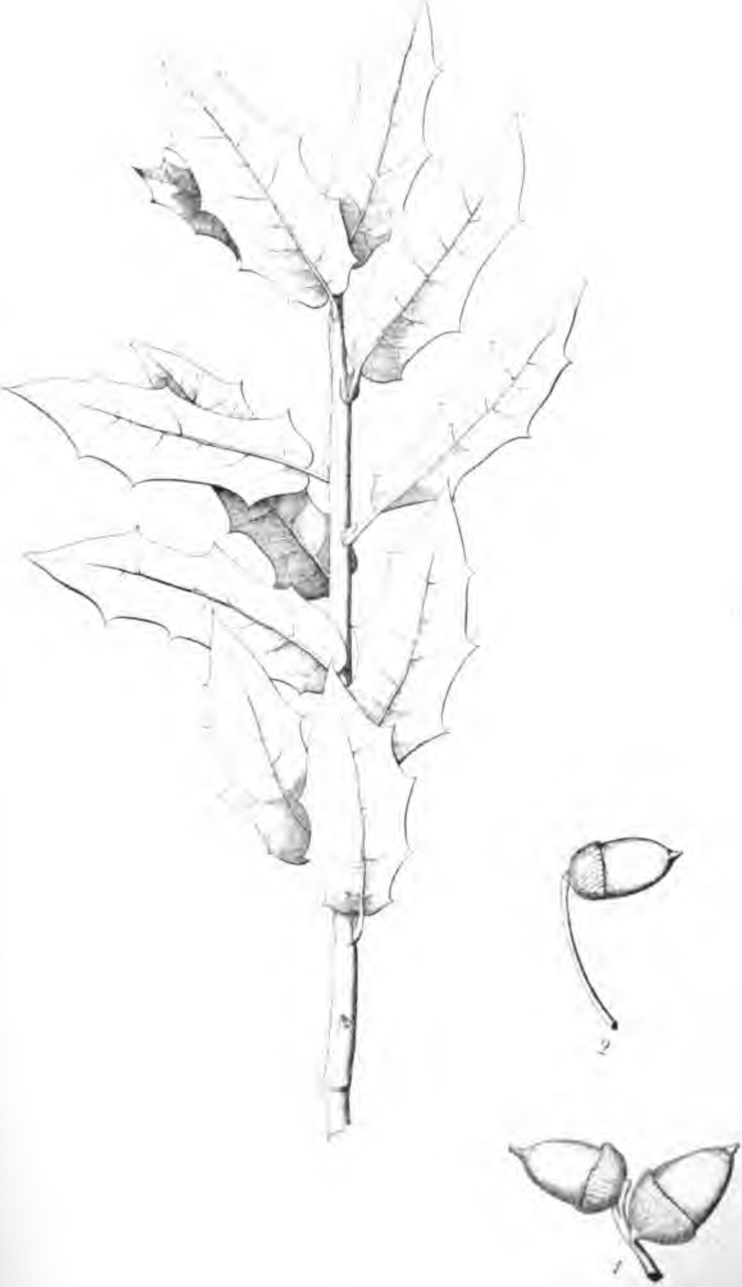
IX



QUERCUS EMORYI.

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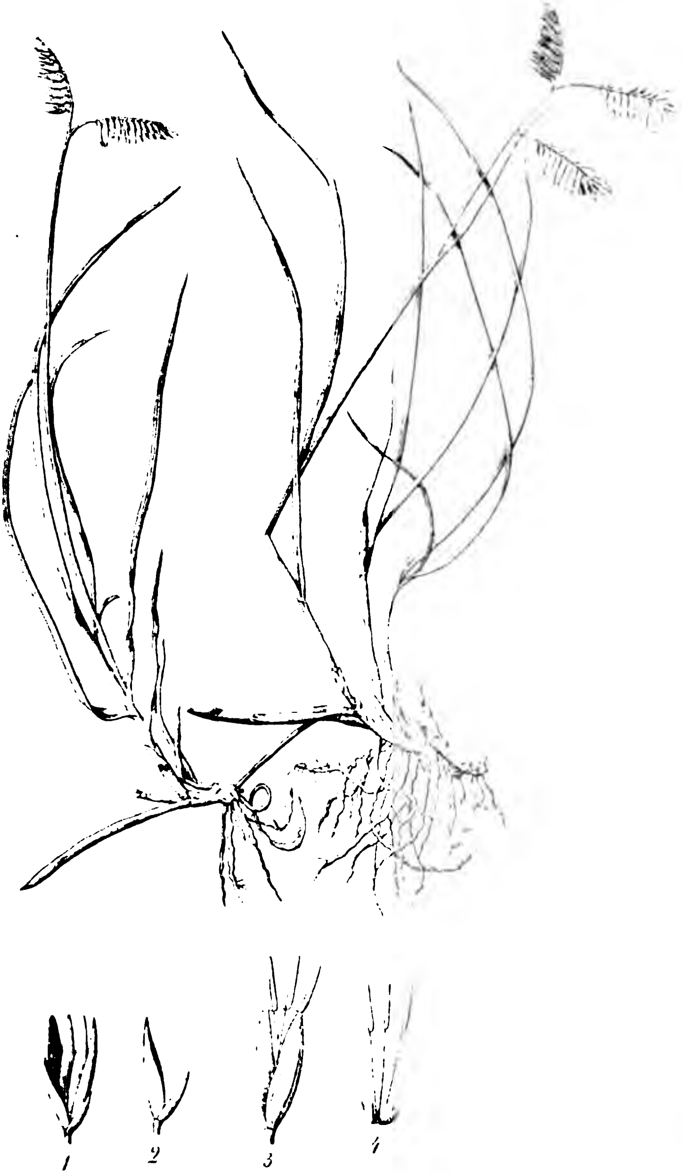

SESLERIA DACTYLOIDES

Lith. by E. Weber & Co Balto.

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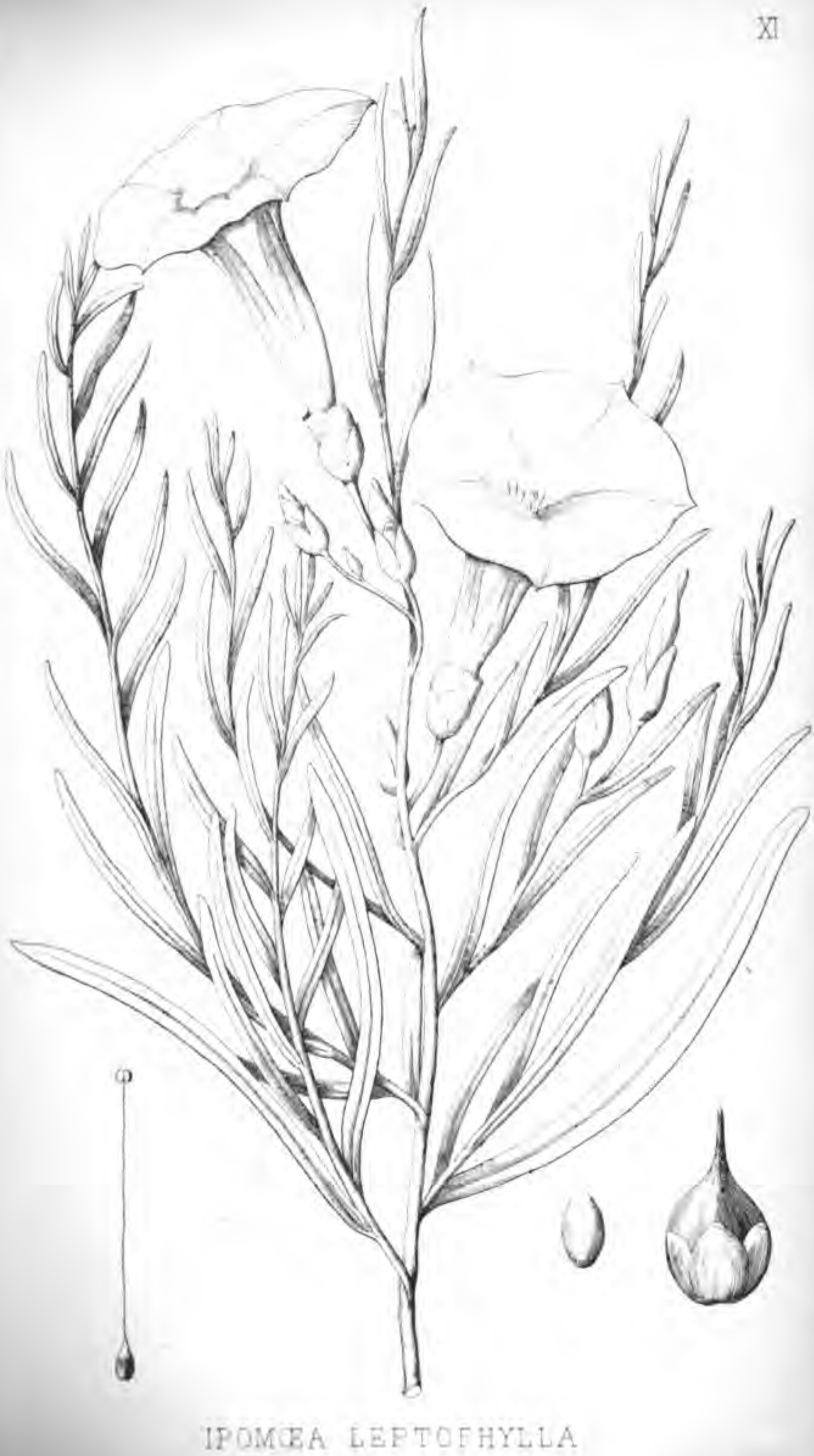
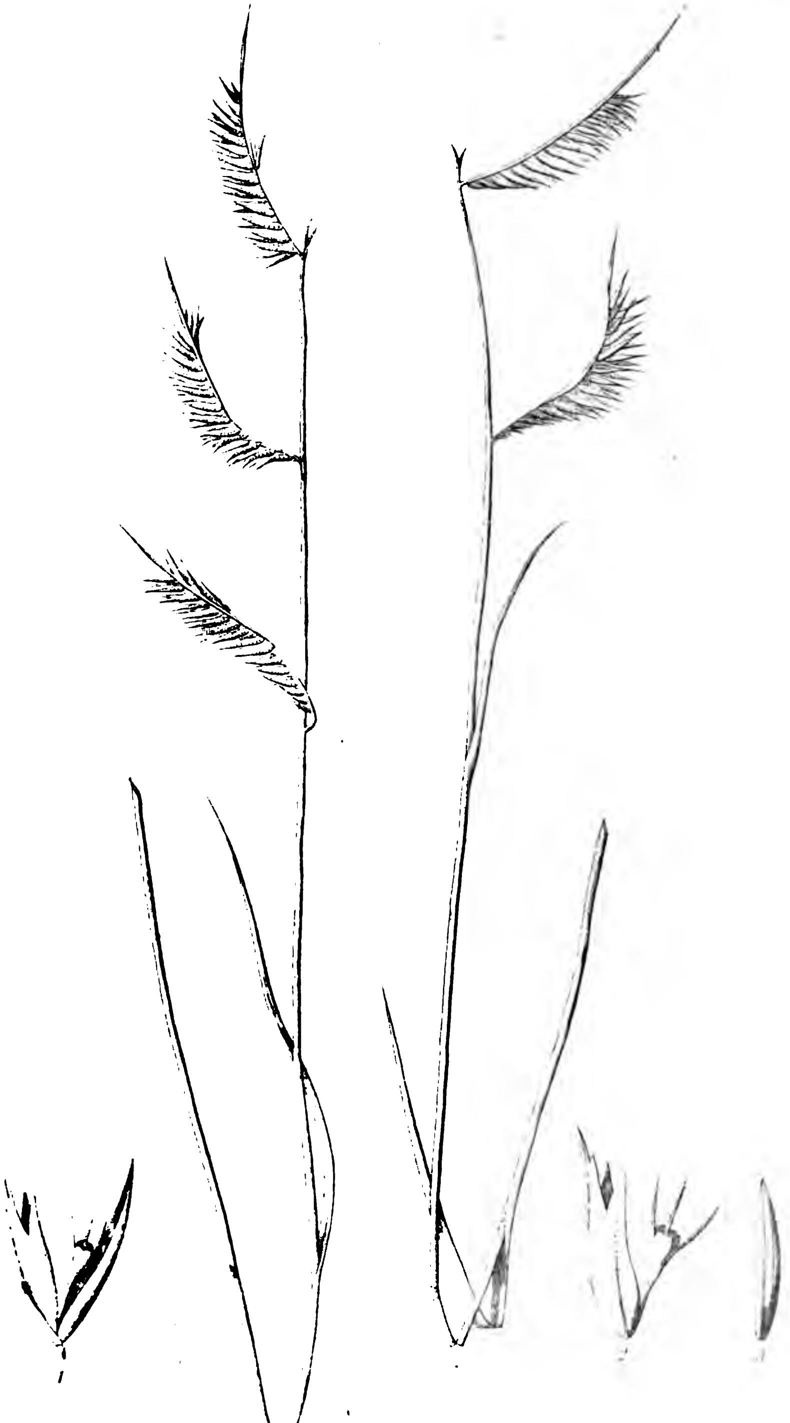
XI



IPOMŒA LEPTOPHYLLA

Lith. by A. Hoen & Co. Balto.



BOUTELOUA [illegible]RENEUM

APPENDIX NO. 2.—(CONTINUED.)

ST. LOUIS, *February* 13, 1848.

MY DEAR SIR: Your letter, together with the package containing the drawings of a number of most interesting cactaceæ, arrived safely here about two weeks ago.

On the occasion of my report on the botany of Dr. Wislizenus' voyage, I have made a careful investigation of the cactaceæ; of which he brought home with him more than twenty species, and have been enabled to elucidate several points which had been unknown, or obscure before; no doubt because in the hot houses of European gardens these curious plants, though they thrive pretty well, rarely produce flowers and fruit; so that from 800 species of cactaceæ at present cultivated in Europe, perhaps not one-fourth is known as to its flower, and a much smaller proportion in fruit.

I have ventured to describe some of your species from the drawing; my description, however, and the names given by me, must remain doubtful till we are able to obtain some more data to characterize the species. I have written it more for your information than for publication, but if you choose to append it to your published report, I have no objection to it, but must request you to make such corrections or alterations as your notes or your recollection of the plants will enable you to do; for example, as to size, as in some of the drawings no size is mentioned,* in which case I have assumed them to represent the natural size. I have, for convenience sake, numbered the different figures, and shall now proceed to copy for you the descriptions and remarks following my numbers.

1. *Mammillaria.* October 18, 1846; head waters of the Gila, 6,000 feet above the sea.

Proliferous in the highest degree, forming hemispherical masses often of a diameter three and a-half feet; which are composed of 100—200 different heads or stems. Single heads conical, apparently about 4 or 5 inches high, and 2½—3 inches in diameter; color, bluish green; spines white or reddish.

This species appears to be allied to *M. vivipara*, but is distinguished by the conical heads, and the hemispherical tufts, while *M. vivipara* has hemispherical or even depressed heads, and forms flat and spreading masses.

It may be an undescribed species, in which case the name of *M. aggregata* appears to be most appropriate.

2. *Mammillaria.* October 26, 1846. Rare; on the Gila, 3 or 4,000 feet above the sea.

Apparently a *mammillaria*, though the habit of the plant is more that of an *Echinocereus*, but all *Echinocerei* have the bunches of spines disposed in verticle ridges, which is not the case in the figure in question. Stems irregularly cylindrical, with divers contractions and swelling, about 4—6 inches high, and 1¼ and 1¾ inches in diameter, many (in the figure 8,) from one base.

The name of *M. fasciculata* would indicate the peculiarity of this species.

3. *Mammillaria.* November 4, 1846; abundant.

Several (fig. 3,) oval stems from one base, 1½—2½ inches high, and 1¼ inch in diameter; tubercles in about 13 rows; spines whitish, short; one small obovate red berry toward the apex not more than 1½ line long.

If the figure is correct, this species ought to be distinguished by the name of *M. microcarpa*, as I know of no other Mammillaria with such a small fruit.

4. *Echinocactus Wislizeni.* (Engelm. in Wislizenus' report.) October 26, 1846.

In addition to the description in Dr. W.'s report, which I have drawn up from dried specimens, I observe in this figure that the species has 21 oblique ribs, is of an oval shape, and bluish green color; the ribs are acute, but not compressed, according to the representation of a section, and the groves corresponding.

5. *Echinocactus.* October 25, 1846; 18 inches in diameter.

Height equal to the diametet; shape ventricose, contracted towards the vertex, therefore somewhat urceolate; with 21 straight sharp ribs; spines apparently 8, straight, brown, color of plant bright green; vertex whitish, (tomentose?) fruit 1 or 1½ inches long, oval, yellowish or reddish. Seed obovate, obliquely truncated at base, full one line long, black, opaque, slightly roughened; embryo curved or hooked, cotyledons accumbent, partly buried in the large farinaceous albumen.

This species is distinct from all other New Mexican species examined by me, and is most probably undescribed. I propose to name it after its zealous discoverer, who has, surmounting numberless difficulties, though occupied by severe and arduous duties, found leisure to do so much for the advancement of our knowledge of the wild countries traversed by him, *Echinocactus Emoryi.*

6. *Cereus.* November 21, 1846; 3 feet high.

There can be but little doubt but that we have here a species before us, which I have received from Dr. Wislizenus and from Dr. Gregg, from the neighborhood of Chihuahua, and which I have described in Dr. W.'s report by the name of *C. Greggii*, erect, branching, with 5 compressed ribs, dark green, with whitish areolæ, and about 8 short dusky spines.

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*Where the size is not mentioned, the original drawings are the size of nature. W. H. E.

The specimen figured here is very remarkable on account of the fruit, which was unknown to me. Provided the drawing is correct, we have here a smooth oval accuminate fruit, crowned with the remains of the corolla, and supported by a distinct stipe of a bright crimson color. A stipe, as well as such an acumination, I have not seen in any other fruit of a cactus. Fruit, with the long acumination, 2½ inches long, ¾ to 1 inch in diameter, stipe about ½ inch long.

7. *Opuntia*. Very abundant on the Del Norte and Gila.

No date nor statement whether the figure represents the natural size or is smaller. The species belongs to the section *ellipticæ* of Salm; it is ascending, older stems prostrate, branches and younger joints erect, 8—10 inches high; joints orbicular obovate, rounded, obtuse or sometimes acutish, of a bluish green color, 1½ to 2½ inches long, and little less wide; spines short and whitish; berries obovate, scarlet, only about 3 or 4 lines long. If the figure represents the natural size, this species ought to bear the name *O. microcarpa*.

8. *Opuntia*. October 28, 1846; common on the Gila.

Much branched, sub-erect, joints obovate, often acutish, purplish, with two or three longer brown spines directed downwards; fruits obovate, red. In the figure, the joints are 1½—2 inches long, and 1—1½ wide; fruit about 8 lines long.

There are several opuntiæ known with purple colored joints, but none in the least resembling this, and I must consider it as a distinct species to which I would give the name of *O. violacea*.

9. *Opuntia?* October 22, 1846; abundant on the Del Norte and Gila.

A remarkable plant, apparently more like a *Mammillaria* than like an *Opuntia*. The fruit is also represented without areolæ or tubercles, exactly like the smooth fruit of a *Mammillaria*; but this may be an oversight in the artist. The habit of the plant suggests the belief that it is an opuntia of the section *cylindraceæ*.

Joints or branches ascending, cylindrical, tuberculated, 4—6 inches long; 1—1½ inches in diameter; tubercles very prominent, with about 8 long (1—1½ inches,) straight spines; fruit obovate, umbilicate, scarlet, towards the top of the branches, about 9 lines long, and 6 in diameter.

It is a distinct species, which I am gratified to dedicate to the skilful artist who has drawn all these figures, Mr. J. M. Stanly; I therefore propose for it the name *Opuntia Stanlyi*.

10. *Opuntia*. November 3, 1846; 4 feet high.

Stem erect, with verticillate horizontal, or somewhat pendulous branches; branches cylindrical, strongly tuberculated, about 8 lines in diameter, with short spines on the tubercles; fruit pale yellow, clavate, tuberculate, umbilicate, 1 to 1½ inches long, 6—8 lines in diameter.

This is probably the *Opuntia arborescens, Engelm. in Wisliz's report*, though the spines are represented as being shorter than in my specimens of *O. arborescens* from New Mexico and Chihuahua.

11. *Opuntia*. November 2, 1846.

Somewhat resembling the last, but forming "low, wide spreading bushes." Joints more slender, only about 4 or 5 lines in diameter, alternating (not opposite nor verticillate,) forming with the stem an acute angle, sub-erect, tubercles more prominent, areolæ whitish at their lower edge, with 3 dusky deflexed spines; fruit clavate, tuberculate, pale yellow, 1 inch long, 4 lines in diameter.

I believe this to be an undescribed species, and would propose the name for it of *O. Californica*.

12. *Opuntia*. October 10, 1846; abundant. Three feet high, with spreading branches; the same in circumference.

I can see no difference between this figure and a plant which I have received from El Passo, by Dr. Wislizenus, and which I have described in his report under the name of *O. vaginata*.

Nos. 13—15 are no Cacti. In 13, I recognize the *Kœberlinia zuccarini*, a shrub common in the chaparals of northern Mexico, which has been collected in flower about Parras and Saltillo, by Drs. Wislizenus and Gregg. The fruit is unknown so far; the specimen figured is, however, in fruit; the berry (?) is globose, ¾—1 line in diameter, crowned with the rudiment of the style. It was collected October 23d, 1846, and is described as a shrub 3 feet high, with low, spreading boughs.

14. Collected November 15, 1846; 4 feet high, rare.

Is, perhaps, another species of the same genus, but the entire absence of flower or fruit makes it impossible to decide. Branches similar, straight, leafless, ending in robust dark spines; but much elongated and sub-erect, not horizontal, as in No. 13.

15. Is entirely unknown to me. Perhaps it is an *amaryllidaceous* plant; the fruit is said to be 5 inches long.

A gigantic cactus was observed along the Gila river, about the middle part of its course, N° 1

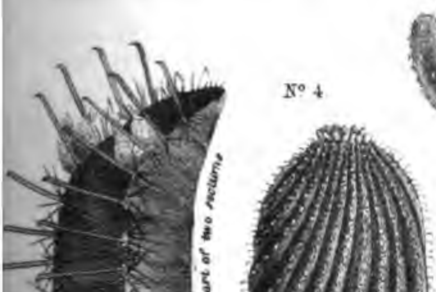
N° 6

N° 2.

N° 3.

N° 7

N° 4


A part of two sections
Cross sections

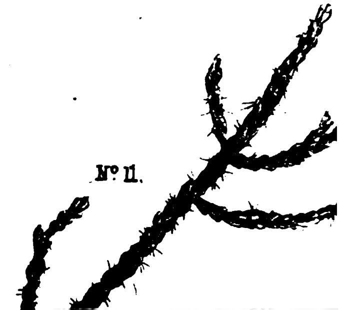
N° 8

N° 5

ARY

N°12

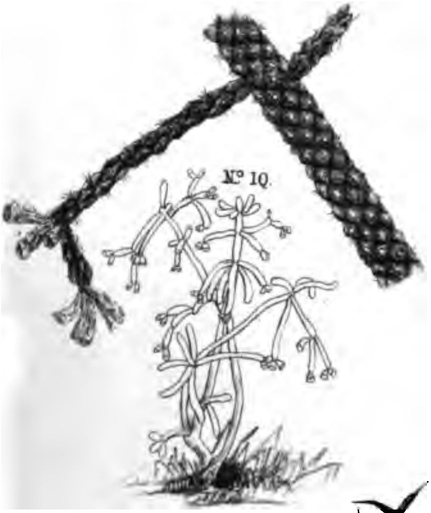
N° 11.



N°15

N°

N° 10.



N° 9.

N°13.

at an elevation of from 2,000 to 4,000 feet; it is frequently mentioned in the report from the 1st to the 9th of November, and figured on several plates, (p. 72 to 79.) It most probably is a true *Cereus*. I judge so from the seed, which fortunately has been preserved. This is obovate, obliquely truncate at base, black, smooth, shining, small, (only about 0.7 lines long;) the embryo is hooked, the cotyledons foliaceous, incumbent; no albumen. If it is a constant fact, that the cotyledons of the seeds of the genus *Pilocereus* are thick and globose and straight, the plant in question cannot belong to that genus, which comprises the most gigantic of the Cactus tribe.

The large *Cereus*, *C. Peruvianus*, is vastly different from our plant, which I would propose to name *Cereus Giganteus*. Unfortunately, I can say but little about the character of this species. The stem is tall, 25 to 60 feet high, and 2 to 6 feet in circumferance, erect, simple, or with a few erect branches; ribs about 20, oblique or spiral, (?) no spines, (?) (Emory's notes; probably only below without spines,) fruit produced toward the top of the stem or branches. (None of the fruit was procured, being too late in the season; but the molasses expressed from it by the Indians was procured in abundance at the Pimos village.)

It is called *Pitahaya* by the Californians, but this appears to be a general name applied in Mexico and South America to all the large columnar Cacti which bear an edible fruit; especially to *Cereus variabilis*, which is common on the eastern coast, but is widely distinct from our California giant.

Very truly, yours,

G. ENGELMANN.

APPENDIX No. 3.

Table of meteorological observations.

Places of observation.	Date.	Time.	Barometer.	Thermometer.			Approximate altitude.	Remarks.
				Attached.	Free.	Wet bulb.		
				C.	F.	F.		
Fort Leavenworth	June 23	3 p. m.	73.75	18	62½	......	....	Raining NE.
Do	June 24	9 a. m.	74.24	16½	73	......	....	Wind NE.; cloudy.
Do	do	12 m.	74.11	19	71½	......	....	Wind NNE.; cloudy.
Do	do	3 p. m.	74.12	19	70	......	....	Cloudy, with occasional showers.
Do	June 25	9 a. m.	74.20	21.5	70	......	....	Cloudy.
Do	do	12 m.	74.04	24	74	......	....	Cloudy.
Do	do	3 p. m.	73.98	25½	77	......	....	Light cloudy; wind SE.
Do	June 26	9 a. m.	73.92	22½	78	......	....	Few light clouds; wind west.
Do	do	12 m.	74.16	24.5	76	......	....	
Do	do	3 p. m.	73.90	26	78	......	....	Clear wind NW.; gentle breeze.
Do	June 27	6 a. m.	73.81	21	75	......	....	Clear.
Camp 2, Strangers' creek	Jnne 28	5 p. m.	73.64	30	84	80	1044	
Do ....do	June 29	5.30 a. m.	73.68	21	70	68		
Camp 3, Kansas river	June 30	5 a. m.	74.09	22	72	71.5	850	Clear.
Camp 4, Oregon trail, on the Wakurussi	June 31	6 p. m.	74.20	26	78	73.5	781	Gentle breeze NE.; very fair.
Camp 4, Oregon trail, on the Wakurussi	July 1	5.30 a. m.	74.40	20.5	71	69		Cloudy.
Camp 5, on the Santa Fé road	do	7 p. m.	73.58	27½	79	74½	1060	Very fair; clear and beautiful sunset.
Do........do	July 2	5 a. m.	73.60	21	70	67		Heavy mist and dew.
Camp 6, on 110 mile creek	do	7 p. m.	73.28	29	82	75	1279	Brisk wind from SW.
Do......do	July 3	5 a. m.	73.28	21	72	69		Fresh breeze south.
Camp 7	do	7 p. m.	72.77	27	81	74	1363	Strong breeze; wind SSE.
Do	July 4	4.30 a. m.	72.86	22	70	69		Clear.

Camp 8, Big John spring.......	do.........	7 p. m....	72.64	29	88	77	1456	Wind SE.
Do.......do.............	July 5.......	4.30 a. m.	72.54	23	78	70		Clear; temperature Big John spring 58° Fa.
Camp 9, Diamond spring.......	do.........	7 p. m....	72.33	24½	78	75	1511	Very fair; no wind.
Do.......do.............	July 6.......	4.30 a. m.	72.49	23	73	70		Cloudy; temperature of spring 54° Fa.
Camp 10, Cottonwood stream...	do.........	7 p. m....	72.64	28	83	76	1372	Clear.
Do..............do.......	July 7.......	6 a. m....	72.85	24	77	74		Clear; gentle breeze south.
Do..............do.......	do.........	6 p. m....	72.86	27	80	73½		Gentle breeze SE.
Do..............do.......	July 8.......	4.30 a. m.	72.81	20	70	68		Hazy; very heavy dew.
Camp 11, Turkey creek.........	do.........	7 p. m....	72.26	25	78	72½	....	Wind SE.
Do........do.............	July 9.......	4 a. m....	72.17	21½	73	70½	....	Cloudy; drizzling rain.
Camp 12, Little Arkansas river..	do.........	7 p. m....	71.89	25	77½	73	1695	Wind E. by S.; raining during the day.
Do..............do.......	July 10.......	4 a. m....	72	23½	75	72½		Appearance of rain; lightning, with thunder; wind E. by S.
Camp 13, branch of Cow creek..	do.........	7 p. m....	71.88	26½	78½	76	1703	Clear; has been raining most of the day.
Do..............do.......	July 11.......	4 a. m....	71.97	22	72	71		Cloudy; heavy rain during the night.
Camp 14, Arkansas river, where the Santa Fé road first strikes it.........................	do.........	7 p. m....	71.94	27	79	75	1642	Very fair and calm.
Camp 14, Ankansas river, where the Santa Fé road first strikes it.........................	July 12.......	4.30 a. m.	71.99	20	69	67		Heavy mist and dew.
Camp 15, on the Arkansas......	do.........	7 p. m....	71.59	28	77½	73	1840	Sun set fair; no wind.
Do..........do............	July 13.......	4.30 a. m.	71.53	20	68½	67		Misty.
Camp 16, Pawnee fork.........	do.........	7 p. m....	71.07	28	79	74	1932	Light breeze from east.
Do........do.............	July 14.......	6 a. m....	71.26	22	73	71½		Very fair.
Do........do.............	do.........	7 p. m....	71.29	30	81½	74		Wind E. by S.
Do........do.............	July 15.......	5.30 a. m.	71.40	22	72½	70		Fair.
Do........do.............	do.........	7 p. m....	71.49	27	79	71		Wind E. by S.
Do........do.............	July 16.......	5 a. m....	71.60	19½	67	64		Fair; light breeze E. by S.
Camp 17, on the prairies, out of sight of, and about two miles from, the river...............	July 17.......	5 a. m....	71.44	13	55	54	1797	Clear; light easterly wind.
Camp 18, on the prairie.........	do.........	7 p. m....	71	23	70	58½	2013	Wind east.
Do........do.............	July 18.......	5 a. m....	71	17	61	57		Clear; strong breeze S. by E.
Camp 19, on the Arkansas......	do.........	7 p. m....	70.85	26	76	67	2196	Clear; strong wind SE.
Do........do.............	July 19.......	5.20 a. m.	70.44	16½	62	58½		Clear; strong wind south.
Camp 20, Jackson grove.........	do.........	7 p. m....	69.92	27	78	69½	2519	Wind E. by S.; clear.
Camp 21, on the Arkansas......	July 20.......	7.30 p. m.	69.50	26	80	68	2652	Cloudy in the west.
Do........do.............	July 21.......	8 a. m....	69.48	20	69½	64½		
Camp 22, on the Arkansas......	do.........	7 p. m....	68.83	30	86	67	2940	Heavy clouds to the west, and furious wind about 8 p. m. from the same quarter.

APPENDIX No. 3.—METEOROLOGICAL OBSERVATIONS—Continued.

Places of observation.	Date.	Time.	Barometer.	Thermometer.			Approximate altitude.	Remarks.
				Attached.	Free.	Wet bulb.		
				C.	F.	F.		
Camp 22, on the Arkansas......	July 22......	7 a.m....	68.94	22½	74½	64	2940	
Camp 23, on the Arkansas......	do........	7 p.m....	68.67	30	86	66	2988	Clear; light breeze E. by N.
Do.........do..........	July 23......	5 a.m....	68.79	19	67	65		Sky overcast in the west.
Camp 24, on the Arkansas......	do........	7 p.m....	68.10	26	81	70½	3268	Clear; light wind E. by S.
Do.........do..........	July 24......	5.30 a.m.	68.28	19	68	63		Strong wind SE.; sky overcast to the west.
Camp 25, on the Arkansas......	do........	7 p.m....	67.94	29	83	74	3319	Clear; wind E. by S.
Do.........do..........	July 25......	4.45 a.m.	67.95	21½	72	64½		Clear; light breeze SE.
Camp 26, on the Arkansas......	do........	7 p.m....	67.75	30	84	61	3396	Clear; wind light, SE.
Do.........do..........	July 26......	5 a.m....	67.82	23	71½	62		Overcast in the west; wind south.
Camp 27, on the Arkansas......	do........	7 p.m....	67.29	29½	84½	68	3594	Wind E. by S.; darkly overcast in the east.
Do.........do..........	July 27......	5 a.m....	67.26	21	70	64		Clear; wind E. by S.
Camp 28, on the Arkansas......	do........	7 p.m....	66.69	25	74½	65	3779	After a severe hail storm, with thunder and lightning, dark clouds in the east; appearance of more rain; wind SE.
Do.........do..........	July 28......	5 a.m....	66.80	20	66	62		Clouds in west; no wind.
Camp 29, on the Arkansas......	do........	7 p.m....	66.51	29½	78	62	3862	Clear; no wind.
Do.........do..........	July 29......	5 a.m....	66.60	16	58	54		Clear.
Camp 30, near Bent's fort......	do........	7 p.m....	66.51	25	76	62	3942	Sky overcast in the NW.; strong wind NE.
Do.........do..........	July 30......	6 a.m....	66.61	20	69	59½		Clear.
Do.........do..........	do........	7 p.m....	66.42	29	84½	67		Clear; wind E. by S.
Do.........do..........	July 31......	6 a.m....	66.46	15	62	57		Clear.
Do.........do..........	do........	7 p.m....	66.43	33	87	67		Clear; strong breeze E. by S.
Do.........do..........	August 1.....	5 a.m....	66.38	18	64½	55		Clear.
Do.........do..........	do........	7 p.m....	66.21	32	86	62		Wind E. by S.; clear.
Do.........do..........	August 2.....	6 a.m....	66.18	21	70	58		Clear.
Camp 31, on the Timpa........	do........	7 p.m....	65.10	31	86	61	4523	Clear; high wind SE.
Do.........do..........	August 3.....	5.30 a.m.	65.11	21	71	57		Wind south.
Camp 32, on the Timpa........	do........	7 p.m....	64.74	30½	87	61	4761	Slight haze; wind south.

Do..........do..........	August 4....	5 a. m....	64.81	21	71¼	55	4761	Wind south.
Camp 33, Hole in the Prairie....	August 5.....	5.30 a. m.	62.57	19	68	55	6560	Clear; wind W. by S.
Camp 34, on the Purgatory.....	do........	7 p. m....	61.79	25½	80	62	5896	Strong wind W. by S.
Do..........do..........	August 6.....	5.30 a. m.	61.91	15	60	52		Clear; wind SW.
Camp 35, valley of the Raton...	do........	7 p. m....	58.98	22	70	53	7169	Clear.
Do..........do..........	August 7.....	6 a. m....	59.04	14	59½	54½		Sky clear; sun just rising above the mountain.
Summit of the Raton..........	do........	10.30 a. m.	58.01	25	74	..	7754	Fair.
Camp 36, on the Canadian......	do........	7 p. m....	61.28	23½	72	68	6112	Cloudy in the east after a slight rain.
Do..........do..........	August 8.....	6 a. m....	61.27	12	57	52		Clear; no wind.
Do..........do..........	do........	7 p. m....	61.26	23½	72	62½		Dark clouds in the west; calm.
Do..........do..........	August 9.....	5.30 a. m.	61.30	11	53	51		Clear.
Camp 37......................	do........	7 p. m....	61.27	22¼	70½	66	6109	Sky overcast in the SW.; light shower on the march, 4 p. m.
Do..........................	August 10....	5 a. m....	61.26	12½	56	52		Wind SW.; hazy towards south.
Camp 38, on Cimmaron Citon...	do........	7 p. m....	61.46	24	69½	58½	6027	Sky overcast in the west.
Do..........do..........	August 11....	5 a. m....	61.34	10	51	48½		Clear and calm.
Camp 39, on the Ocaté..........	do........	7 p. m....	59.43	23	71	63	6946	Cloudy, and overcast in the west.
Do..........do..........	August 12....	6 a. m....	59.56	16½	61½	53		Darkly overcast in the west; wind east.
Camp 40, at the Pools.......	do........	7 p. m....	60.20	21	69	59	6670	Wind E. by N.; sky overcast in the west.
Do..........do..........	August 13....	6 a. m....	59.82	11½	52	49		Clear.
Camp 41, on the Sapillo........	do........	6 p. m....	60.65	20½	68	64	6395	Just cleared off after a very heavy shower from the SW.
Do..........do..........	August 14....	5.30 a. m.	60.60	14½	56½	54		Clear and calm.
Camp 42, at the village of the Vegas..........................	do........	6 p. m....	60.69	24	72	69	6418	do
Camp 42, at the village of the Vegas..........................	August 15....	6 a. m....	60.65	13	55	54		
Camp 43, Vernal Springs......	do........	6 p. m....	60.87	28	75	65	6299	do
Do..........do..........	August 16....	5.30 a. m.	60.98	14	57½	53		
Camp 44, half mile south of the Pecos..........................	do........	6 p. m....	60.76	25	75	63	6346	Sky overcast in the west.
Camp 44, half mile south of the Pecos..........................	August 17....	5.30 a. m.	60.82	14	57	53		Clear and calm.
Camp 45, on the Pecos, near Pecos village................	do........	6 p. m....	59.73	21½	69	65	6366	Light wind and rain from east.
Camp 45, on the Pecos, near Pecos village................	August 18....	5.15 a. m.	59.72	15½	61½	59		Heavy clouds and mist; rain throughout the night.
Santa Fé......................	August 19....	6 a. m....	59.56	14	59	55½	6846	Sky clouded; looks like rain; calm.
Do..........................	do........	6 p. m....	59.52	20½	67	59		Sky clear; no wind.
Do..........................	August 20....	7 a. m....	59.61	18½	62½	59		Clear.

APPENDIX No. 3.—METEOROLOGICAL OBSERVATIONS—Continued.

Places of observation.	Date.	Time.	Barometer.	Thermometer.			Approximate altitude.	Remarks.
				Attached.	Free.	Wet bulb.		
				C.	F.	F.		
Santa Fé	August 20	6 p. m.	59.50	19	64	58	6846	Clear; wind E. by N.
Do	August 21	6 a. m.	59.84	18	58½	56		Clear.
Do	do	6 p. m.	59.75	18	58¼	55		Cloudy after rain.
Do	August 22	6 a. m.	60.03	17	57	53		Clear and calm.
Do	do	6 p. m.	59.80	19	63	58¼		do
Do	August 23	7 a. m.	59.97	17¾	60	55		do
Do	do	6 p. m.	59.71	21	64	60		do
Do	August 24	7 a. m.	59.83	19	61	56		Clear.
Do	do	6.30	59.53	22	65½	61		do
Do	August 25	8 a. m.	59.67	20	64	56½		Clear; gentle breeze N. by E.
Do	do	6 p. m.	59.78	19	62	58		Raining; wind NE.
Do	do	7.30 a. m.	60.04	19	62	57		Sky overcast; looks like rain; no wind.
Do	August 26	6 p. m.	59.92	20	60¼	56¼		Clear.
Do	August 27	7 a. m.	60.01	17	57¼	52¼		do
Do	do	6 p. m.	59.82	21½	63¼	57		Calm and clear.
Do	August 28	8 a. m.	59.87	19	60	56		do
Do	do	6 p. m.	59.74	22	71	58		do
Do	August 29	7 a. m.	59.88	20	62	51¼		do
Do	do	6 p. m.	59.69	22½	74	61¼		Clear and calm.
Do	August 30	8 a. m.	59.77	19¼	66¼	54¼		do
Do	do	6 p. m.	59.47	23¼	75	59		do
Do	August 31	6 p. m.	59.37	22	70	53		Clear.
Do	September 1	7 a. m.	59.50	18	61	54		Clear and calm.
Do	do	6 p. m.	59.35	21¼	69¼	60		do
Camp 47, Galisteo creek	September 2	6 p. m.	63.92	27¼	80½	62		Clear, wind SW.
Galisteo creek	September 3	6 a. m.	62.58	14¼	56	51		Clear and fair.
Camp 48, two miles below San Felipe	do	5.45	63.15	27	77	63	5158	Clear and calm.

San Felipe	September 4	6 a. m	63.45	18	61	......	5158	Gentle wind E. by S.
Camp 49, quarter of a mile south of the Alameda	do	5.30 p. m	64.08	24½	75	59	....	Fair; wind NW.
Camp 49, quarter of a mile south of the Alameda	September 5	6 a. m	63.63	13½	51	51	....	Fair and calm.
Camp 50, on the Rio del North 8½ miles below Albuquerque	do	6 p. m	63.61	24½	74½	58	....	Wind SW.
	September 6	6.30 a. m	63.85	10	51	49	....	Fair and calm.
Camp 51, near Peralta, about 500 feet northwest of the Chavez church	September 7	7.15 a. m	64.06	17	63	55	4862	
Camp 52, about one mile north of Tomé	do	6.30 p. m	64.39	29½	74	62	....	Calm and clear.
Camp 52	September 8	6.30 a. m	64.26	14	57	53	....	Fair and calm.
Camp 54, on the return, same as camp 49	September 9	6 p. m	63.17	21½	67	57	....	Clear and calm.
Camp 54, on the return, same as camp 49	September 10	7 a. m	63.53	8½	50	48	....	do
Camp 55, about one mile south of San Felipe	do	6 p. m	63.47	25	67	57	....	Calm and clear.
Camp 55, about one mile south of San Felipe	September 11	7 a. m	63.86	8½	46	......	....	do
Camp 56	do	6 p. m	61.94	28½	73½	58	....	do
Do	September 12	6 a. m	62.01	14	56	......	....	Clear; wind E. by S.
Santa Fé	September 13	8 a. m	59.70	21	69	59	....	Clear and calm.
Do	do	6 p. m	59.57	24½	74	61½	....	Sky overcast in the south; wind E. by S.; light refreshing shower at 4 p. m.
Do	September 14	6 p. m	59.77	22	70½	63	....	Sky overcast immediately after a shower; no wind.
Do	September 15	7 a. m	59.91	21	68	58	....	Calm and clear.
Do	do	6 p. m	59.73	19½	65	......	....	Just clearing off after a shower; wind NE.
Do	September 16	8 a. m	59.67	20	66½	59	....	Clear and calm.
Do	do	6 p. m	59.54	22	70½	52	....	Calm and clear.
Do	September 17	8 a. m	59.75	19	64	54	....	Clear and calm.
Do	do	6 p. m	59.58	23	71	56	....	do
Do	September 18	6 p. m	59.66	23	74½	62	....	Calm and clear.
Do	September 19	7 a. m	59.80	20	65	54	....	do
Do	do	6 p. m	59.65	22	71	51	....	Sky overcast in the south; faint thunder.
Do	September 20	8 a. m	59.79	19½	66	63	....	
Do	do	5.30 p. m	59.75	22	71	53½	....	Clear and calm.
Do	September 21	7.30 a. m	59.91	18	63	51	....	Clear; light wind E. by S.
Do	do	6 p. m	59.66	22	72	63	....	Light shower of rain; wind NE.

APPENDIX No. 3.—METEOROLOGICAL OBSERVATIONS—Continued.

Place of observation.	Date.	Time.	Barometer.	Thermometer.			Approximate altitude.	Remarks.
				Attached.		Wet bulb.		
				C.	F.	F.		
Santa Fé	September 22.	6 p. m.	59.35	20	67½	57	....	Sky overcast; wind west.
Do	September 23.	7 a. m.	59.41	17	58½	61	....	Clear.
Do	do	6 p. m.	59.28	21	66½	56	....	Calm and clear.
Do	September 24.	7 a. m.	59.49	16	59	53	....	Fair; wind from NE.; a heavy shower during the night.
Camp 57	September 25.	6 p. m.	62.13	20½	63	50½	5820	Fair and calm.
Do	September 26.	5.45 a. m	62.08	3	36	......		During the night high wind E. by N.
Camp 58, where the road strikes the river Del Norte	do	6 p. m.	63.88	24	65	53	4910	Calm and clear.
Camp 58, where the road strikes the river Del Norte	September 27.	6 a. m.	64.06	6½	40	......		do
Camp 59, about one mile south of Zandia	do	6 p. m.	64.08	23	68	53	4846	do
Camp 59, about one mile south of Zandia	September 28.	6 a. m.	64.12	5	40	37½		
Camp 60	do	6 p. m.	63.93	25	68	58	6904	do
Do	September 29.	6 a. m.	64.07	5	38	87		do
Camp 61. First camp on the west side of the Rio del Norte, about seven miles below Albuquerque	do	6 p. m.	64.27	21½	67	56	4756	do
Camp 61. First camp on the west side of the Rio del Norte, about seven miles below Albuquerque	September 30.	6 a. m.	64.32	3	36	37		do
Camp 62, 7 miles below Isoletta	do	6 p. m.	64.53	26½	70½	58	4636	Clear and calm.
Do do	October 1.	6 a. m.	64.70	12½	51	47		Calm and clear.
Camp 63, below Tomé 9 miles	do	6 p. m.	64.59	25½	69	54	4667	No wind; clear.

Do..............do...........	October 2....	6 a. m.....	64.48	4½	37	35	4670	Clear and calm.
Camp 64..........................	do..........	6 p. m.....	64.65	30½	70½	57	4610	do
Do..........................	October 3....	6 a. m.....	64.70	4½	38½	39		do
Do..........................	do..........	6 p. m.....	64.66	29	72	55		do
Do..........................	October 4....	6 a. m.....	61.65	5	40	38		Calm and clear.
Camp 65..........................	do....	6 p. m.....	65.79	26	7½	54	4556	Clear and calm.
Do..........................	October 5....	6 a. m.....	65.76	5½	41	37		do
Camp 66, near Socorro..........	do..........	5.30 p. m.	64.72	27	72¼	56	4563	Calm and clear; strong breeze from SE. during the afternoon.
Do..........do...........	October 6....	6 a. m.....	61.83	11	51	45		Clear; light wind south.
Camp 67..........................	do..........	6 p. m.....	61.79	25	75	57	4595	Sky overcast in east, and a strong wind from south.
Do..........................	October 7	6 a. m.....	64.56	10	50	46		Clear and calm.
Camp 68..........................	do....	6 p. m.....	64.72	24	71	58	4576	Strong wind from south, which has been blowing all day.
Do..........................	October 8....	6 a. m.....	64.74	10½	48	42		Clear and calm.
Camp 69..........................	October 9....	6 a. m.....	65.16	1½	34½	33½	....	do
Camp 70, east side of the Del Norte..........................	do..........	5.30 p. m.	65.24	24⅓	71½	54	4241	Fair; light wind from south, which has blown strong from the same quarter during the day.
Camp 70, east side of the Del Norte..........................	October 10...	6.30 p. m.	65.26	1½	35	......		Clear and calm.
Camp 70, east side of the Del Norte..........................	do..........	5.30 p. m.	65.37	20¼	62	48		Clear; wind S. by W.
Camp 70..........................	October 11...	6 a. m.....	65.73	1	30	......		Clear and calm.
Do..........................	October 12...	6.30 a. m.	65.99	1½	30	......		do
Do..........................	do..........	5.30 p. m.	65.74	25	69	57		do
Do..........................	October 13...	6 a. m.....	65.85	1½	27	......		do
Camp 71..........................	do..........	5.30 a. m.	65.73	20	66	50	4138	do
Do..........................	October 14...	6 a. m.....	65.76	¾	34	......		do
Camp 72..........................	do..........	5.30 p. m.	65.73	26	72	56	4164	Clear; light wind from the south.
Do..........................	October 15...	6 a. m.....	65.68	6	42	40		Clear and calm.
Camp 73, first after leaving the Del Norte..........................	do..........	5.30 p. m.	64.15	26	76	53	4810	Clear; light wind S. by W.
Camp 73..........................	October 16...	6 a. m.....	64.22	9	48½	......		Clear; light wind SW.
Camp 74..........................	do..........	5.15 p. m.	63.99	22	70	51	5229	Light clouds; wind strong from SW.
Do..........................	October 17...	6 a. m.....	63.06	3	35½	......		Clear; no wind.
Camp 75, in the mountains, between the Del Norte and copper mine..........................	do..........	5 p. m.....	62.73	16	61½	49	5426	Clear; light wind south.

APPENDIX No. 3.—METEOROLOGICAL OBSERVATIONS—Continued.

Place of observation.	Date.	Time.	Barometer.	Thermometer.			Approximate altitude.	Remarks.
				Attached.	Free	Wet bulb.		
				C.	F.	F.		
Camp 75, in the mountains, between the Del Norte and copper mines	October 18	6 a. m.	62.73	2¼	27½	......	5426	Calm and clear.
Top of hill No. 1, between camp 75 and 76	do	11 a. m.	61.98	14	59	......	....	Clear; no wind.
Top of hill No. 2	do	11.40 a. m.	61.73	20	64			
Top of hill No. 3	do	1 p. m.	60.63	23	72	......	6387	
Camp 76, near the copper mines.	do	5 p. m.	61.30	16	58	49	6167	Clear and calm.
Camp 76	October 19	5.30 a. m.	61.28	3	55	......		do
Top of hill	do	1.22 p. m.	61.29	19½	66	......	....	Cloudy in the west; indications of rain from that quarter.
Camp 77	October 20	6.30 a. m.	64.77	2¼	37	......	4587	Clear sunrise.
Camp 78, on the Gila	do	5 p. m.	65.58	21	70	54	4347	Clear and calm.
Do do	October 21	6 a. m.	65.64	4½	40	......		Cloudy; no wind.
Camp 79, on the Gila	do	5 p. m.	66.22	23½	71	56	4096	Light breeze south; clear.
Do do	October 22	6 a. m.	66.38	7	44	43		Cloudy and calm.
Camp 80, on the Gila	do	5 p. m.	66.65	24	74	56	3989	Clear; wind east.
Do do	October 23	6 a. m.	66.63	13	57	49		Cloudy in the west; no wind.
Camp 81, on the Gila	do	5 p. m.	67.08	24½	74	54	3732	Clear; wind south.
Do do	October 24	6 a. m.	66.94	4	27	......		Clear and calm.
Do do	do	5 p. m.	66.93	20½	69	53		Clear; light wind SW.
Do do	October 25	6 a. m.	66.84	3	27½	......		Clear and calm.
Camp 82, on the Gila	do	5.30 p. m.	67.22	20	66½	50	3615	Sky bright; no wind.
Do do	October 26	6 a. m.	67.38	1½	34	......		Sky clouded in the west; light air from NE.
Camp 83, on the Gila, about 50 feet above the river	do	5 p. m.	68.17	23	70	50	3147	Bright clouds; wind light E. by N.
Top of ridge between camp 82 and 83, on the road	do	11.40 a. m.	63.58	20	63	51	....	Fair, with light wind from east.

Camp 83, on the Gila	October 27	6.30 a. m.	68.31	12	54½	46	3147	Sky overcast; wind east; very light; rain during the night.
Do.........do	do	5 p. m.	69.33	17	62	52		Very light rain at intervals during the day and faint thunder; strong wind now from northeast
Do.........do	October 28	6 a. m.	68.35	12¼	55½	50		Wind east; sky overcast; looks like rain.
Camp 84, on the Gila, about 20 feet above the river	do	5 p. m.	68.87	20	65	55	2969	Sky bright, but clouds; calm.
Camp 84	October 29	6 a. m.	68.91	1	35	......		Calm; foggy in the west.
Camp 85, on the Gila, 20 feet above the river	do	5 p. m.	69.40	20¼	66	52	2852	Calm and clear.
Camp 85, on the Gila, 20 feet above the river	October 30	6 a. m.	69.03	4	39½	......		Brilliant clouds in the east immediately before sunrise; calm.
Camp 86, 10 feet above the river	do	5 p. m.	69.53	18¼	63	......	2674	Wind moderate, south; sky overcast in the west.
Do.........do	October 31	6 a. m.	69.72	2¾	36	......		Calm; misty around horizon; light clouds overhead.
Camp 86, on the Rio San Francisco, about 2 miles from the mouth, at the Gila	do	5 p. m.	69.82	19	64	52	2557	Clear and calm.
Camp 87, on the Rio San Francisco, about 2 miles from the mouth, at the Gila	November 1	6 a. m.	69.90	3	25	......		Clear; no wind.
Ridge between 87 and 88	do	2.35 p. m.	64.82	21	62	......	4763	
Top of peak near camp 88, about 1¼ mile west	do	p. m.	62.58	19	61	......	5724	Wind light, W. by S.; sky clear.
Camp 88, in the mountains, on the trail cutting off a bend of the Gila	do	5 p. m.	64.66	14	54½	42	4748	Clear and calm.
Camp 88, in the mountains, on the trail cutting off a bend of the Gila	November 2	6 a. m.	64.54	6	40½	......		Slightly overcast; calm.
Camp 89, Disappointment creek	do	5 p. m.	66.81	19	61	55	3781	Clear; light; light air SE.
Do.........do	November 3	6 a. m.	66.95	1¼	32	......		Clear and calm.
Do.........do	do	5 p. m.	67	19½	63	55		do
Do.........do	November 4	6 a. m.	66.91	6	44	40		Sky overcast; no wind.
Camp 90, on the Gila	November 5	6 a. m.	70.99	13¼	57	47	2172	Cloudy and thick mist around the horizon; wind SE.
Camp 91, on the San Pedro	do	5 p. m.	71.30	21¼	67	52	2115	Clear and calm.
Do.........do	November 6	5 p. m.	71.22	24	68½	58		do

APPENDIX No. 3.—METEOROLOGICAL OBSERVATIONS—Continued.

Place of observation.	Date.	Time.	Barometer.	Thermometer.			Approximate altitude.	Remarks.
				Attached.	Free.	Wet bulb.		
				C.	F.	F.		
Camp 91, on the San Pedro	November 7	6 a. m.	70.98	1	33	......	2115	Clear and calm.
Camp 92, on the Gila	do	5 p. m.	70.79	20	69	50½	2122	Dark clouds in the west; wind south.
Do...do	November 8	6 a. m.	71.72	5	41	......		Heavy rain during the night; morning foggy; no wind.
Camp 93, on the Gila	do	5 p. m.	71.98	14	53	48½	1751	Calm and clear.
Do...do	November 9	6 a. m.	71.94	4	37	......		Heavy frost this morning; sky clear.
Camp 94, on the Gila	do	5 p. m.	72.27	15	55	50	1596	Clear and calm.
Do...do	November 10	6 a. m.	72.35	3	27	......		Sun not risen; sky murky; no wind.
Camp 95, on the Gila	do	5 p. m.	72.93	19	65	53	1419	Clear and fair.
Do...do	November 11	6 a. m.	73.00	4	37	......		do
Camp 96, in the Pimos village, on the Gila	do	5 p. m.	73.23	23½	71	60	1308	Calm and fair.
Camp 96, in the Pimos village, on the Gila	November 12	6 a. m.	73.25	5	40	.....		Sky clear; bright clouds in the east as the sun is rising; no wind.
Camp 97, about four miles from the Gila, after passing the Pimos village	do	5 p. m.	73.69	20	64	51½	1150	Clear and calm.
Camp 97, about four miles from the Gila, after passing the Pimos village	November 13	6.30 a. m.	73.48	3	26	......		do
Camp 98, on trail of the cut-off, — miles from the Gila	do	7.30 p. m.	72.35	14	56	......	1644	Calm; stars shining bright. Left camp 98 at 4 a. m. on the 14th; too early for morning observation.
Camp 99, on the Gila	November 14	5 p. m.	73.87	18	63	57½		Calm; clear.

Do do	November 15.	7.15 a. m.	74.22	7	44	......	845	Calm; clouds and mist around the horizon; we had rain in the night, which commenced about 12 o'clock, and lasted two hours.
Do do	do	5 p. m.	74.64	15	58	48		Clear and calm.
Do do	November 16.	6.15 a. m.	74.83	4	24	......		Clear; no wind.
Camp 100, on the Gila	do	5 p. m.	75.13	14	52½	48	501	Brilliant sunset; clear and calm.
Do do	November 17.	6.45 a. m.	75.42	12	44	......		Sky clear; strong wind from the west.
Camp 101, on the Gila	do	5 p. m.	75.77	16	56	45	293	Clear and calm.
Do do	November 18.	6 a. m.	75.90	5	20½	......		Sky clear; no wind.
Camp 102, on the Gila	do	5 p. m.	76.5	13	50	42	231	Calm and clear.
Do do	November 19.	6 a. m.	75.92	5	21	......		Calm and clear; thermometer, noon, 72.
Camp 103, on an island of the Gila	do	5 p. m.	76.02	15	52	46	236	Calm and clear.
Camp 103, on an island of the Gila	November 20.	6 a. m.	75.98	3	24½	......		Sky clear; no wind. At noon, on the march, thermometer 74.
Camp 104, on the Gila	do	5 p. m.	76.12	20	56	48	248	Fair and calm.
Do do	November 21.	6 a. m.	75.85	5	19	......		Sun not risen; calm and clear.
Camp 105, on the Gila	do	5 p. m.	76.10	19	61	53	253	Clear and fair.
Do do	November 22.	6 a. m.	75.94	2	33	......		Sky clear; star light; no wind.
Camp 106, near the mouth of the Gila	do	5 p. m.	75.67	23	69	51	254	Clear and calm.
Camp 106, near the mouth of the Gila	November 23.	7.30 a. m.	75.57	9¼	49½	......		Sun obscured by clouds.
Camp 106, near the mouth of the Gila	do	5 p. m.	76.17	16	60	43		Strong wind from the east, which has been blowing all day; has just subsided; sky clouded, and misty around the horizon.
Camp 106, near the mouth of the Gila	November 24.	6 a. m.	76.88	7	40	......		Wind northeast; clear.
Camp 107, on the east bank of Rio Colorado	do	5 p. m.	76.84½	13¼	59½	44	....	Clear sunset; calm.
Camp 107, on the east bank of the Rio Colorado	November 25.	6 a. m.	76.54	3	27	......	....	Bright clouds in the east; before sunrise; no wind.
Camp 108, first camp on the Jornada	do	5 p. m.	76.28	16	57½	46	210	Camp on the Jornada; calm and fair.
Camp 108, first camp on the Jornada	November 26.	5 a. m.	75.93	5	21	......		Before daylight; stars shining bright, calm.
Camp 109, on the Jornada	do	5 p. m.	76.28	18	60	......	176	Clear and calm.

APPENDIX No. 3.—METEOROLOGICAL OBSERVATIONS—Continued.

Place of observation.	Date.	Time.	Barometer.	Thermometer.			Approximate altitude.	Remarks.
				Attached.	Free.	Wet bulb.		
				C.	F.	F.		
Camp 109, on the Jornada	November 27.	6.30 a. m..	76.14	1	32	......	176	
Camp 110—Salt Lake on the Jornada....................	do........	9 p. m.....	76.55	6½	45½	......	52	Clear; bright moon, and star-light.
Camp 111, on the Jornada, Cariso creek..................	November 28.	5 p. m.....	75.40	16	59½	52	445	Calm and clear.
Camp 111, on the Jornada Cariso creek..................	November 29.	6.30 a. m..	75.56	3	36½	......		Foggy around the western horizon; bright clouds in the east; just before sunrise; light wind from the west.
Camp 112.....................	do........	5 p. m.....	72.71	17	60	51	1539	Heavy clouds around the western horizon, and wind from the same quarter.
Do.	November 30.	7 a. m.....	72.66	11	50½	......		Dark, heavy clouds hanging over the mountains in the west; sky bright in the east.
Do.	do........	5 p. m.....	72.39	11¼	53	......		High wind from the west, and cloudy in the same quarter.
Camp 112, Valle Citon.	December 1..	6.30 a. m..	72.50	7	39	......	....	Sky clear of clouds, but misty around the western horizon; wind continues from west.
On the "Divide"...............	do........	12.20 p. m.	69.64	11	49	......	2670	Clear; wind high from the west.
Camp 113.....................	do........	5 p. m.....	70.37	8	42	......	2331	High wind from the west, and heavy clouds in the same quarter.
Do.	December 2..	6.30 a. m..	70.41	5	38	......		Night damp; heavy dew this morning; wind moderate from the west; sky bright in the east, but overcast in the opposite quarter.
Camp 114, at Warner's "Agua Caliente".....................	do........	5 p. m.....	68.75	8	47½	43	3013	Calm and clear.

Camp 114, at Warner's "Agua Caliente."	December 3...	6.30 a. m.	68.66	2¼	28	......	3013	Heavy frost; sky overcast; no wind.
Camp 114, at Warner's "Agua Caliente."	do........	5 p. m....	68.67	11	49	46		Sky darkly overcast; light wind west.
Camp 114, at Warner's "Agua Caliente."	December 4...	7 a. m....	68,50	5	40½	41		Cloudy; heavy mist; appearance of rain.
Camp 115, Santa Isabella, on Captain Stoke's rancheria.	December 5...	7 a. m....	68.50	4	38	......	3050	Wind west; raining, and heavy mist around the horizon.
Camp 117, San Pasqual	December 6...	5 p. m....	75.38	11¼	52	47½	716	Day fair throughout; clear sunset; wind moderate from SW.
Do..........do	December 7...	7.45 a. m.	75.75	5½	36	......		Clear; wind moderate, SE.
Camp 118	December 8...	6.30 a. m.	75.39	1½	33	......	477	Heavy frost; no wind; sky overcast with dark clouds.
Do	do........	5 p. m....	75.23	11	50½	......		Clear; wind NW.
Do	December 9...	6.30 a. m.	....	......	35	......		Fair and calm.
Do	do........	5 p. m....	75.54	12½	53	......		do
Do	December 10..	6.30 a. m.	....	......	30	......		
Do	December 11..	6.30 a. m.	....	......	31	......		
San Diego	December 13..	5 p. m....	76.41	14	57	......	30	Wind high SE. It rained during last night, and this morning until noon, with the wind from same quarter.
Do	December 14..	Sunrise....	....	......	55	......		Clear and calm.
Do	do........	5 p. m....	76.80	16	61	58		Light clouds; calm.
Do	December 15..	8 a. m....	77.03	14	59	56½		Thick mist around the horizon; light air from south.
Do	do........	5 p. m....	76.94	14	59	56		Sky cloudy; calm; light rain at noon.
Do	December 16..	8 a. m....	76.76	13	57	52		Sky clear; fair and calm.
Do	December 17..	8.30 a. m.	76.55	12	55½	......		Sky overcast; calm.
Do	do........	5 p. m....	76.37	15	59½	55½		Sky slightly overcast; no wind.
Do	December 18..	8.30 a. m.	76.70	13	56	52		Clear and calm.
Do	do........	5 p. m....	76.55	17	62	58		Sunset brilliant; no wind; fair.
Do	December 19.	9.15 a. m.	76.81	14	59	54		Sky clouded; looking like rain; calm.
Do	do........	5 p. m....	76.76	15¼	62½	58	....	Brilliant sunset; clear and calm.
Do	December 20..	8.30 a. m.	77	14	58½	54	....	Cloudy; no wind.
Do	do........	5 p. m....	76.82	15	61	58	....	Clear; brilliant sunset; calm.
Do	December 21..	8.30 a. m.	76.97	13¼	57	54	....	Quite fair and calm.
Do	do........	5 p. m....	76.72	16	61	56	....	Clear and calm.
Do	December 22..	8.30 a. m.	76.81	14	58½	54	....	Fair; no wind
Do	do........	5 p. m....	76.73	15½	62½	59½	....	Cloudy in the west; calm.

APPENDIX No. 3.—METEOROLOGICAL OBSERVATIONS—Continued.

Place of observation.	Date.	Time.	Barometer.	Thermometer.			Approximate altitude.	Remarks.
				Attached.	Free.	Wet bulb.		
				C.	F.	F.		
San Diego	December 23	8 a. m.	76.80	15	60	56½		Sky clouded and darkly overcast; looks like rain; no wind.
Do	do	5 p. m.	76.83	16	60½	57½		Brilliant sunset; just clearing off; no wind.
Do	December 24	8.45 a. m.	76.77	15	59	55		Cloudy; wind light, NE.
Do	do	5 p. m.	76.58	17	60½	57½		Cloudy in the west; calm.
Do	December 25	8.30 a. m.	76.42	15	60	57		Clear and calm.
Do	do	5 p. m.	76.47	18	65	62		Wind east; brilliant sunset; fair.
Do	December 26	8.30 a. m.	76.66	17	63	......		Raining moderately, though steady; no wind.
Do	do	5 p. m.	76.52	17	61	59		Clear and calm.
Do	December 27	8.30 a. m.	76.72	16	60½	59		Wind NW.; quite fair. We had a heavy snower during the night.
Do	do	5 p. m.	76.70	16	60	56		Clear and calm.
Do	December 28	5 p. m.	76.75	16	60	55		Clear sunset; wind N. by W.
Do	December 29	8 a. m.	76.55	14	56	52		Cloudy; no wind.

APPENDIX No. 4.

TABLE

OF

GEOGRAPHICAL POSITIONS.

APPENDIX No. 4.

TABLE OF GEOGRAPHICAL POSITIONS.

Date.	Places of observation.	Distances measured by the viameter.		North latitude.	West of Greenwich.		Authorities.
		Distance from camp to camp.	Total distance from Fort Leavenworth.		In time.	In arc.	
1846.				° ′ ″	H. M. S.	° ′ ″	
June 23	Fort Leavenworth, on the Missouri...	....	....	39 21 14	6 18 56	94 44 00	Latitude of Fort Leavenworth by W. H. Emory. Longitude of Fort Leavenworth by J. N. Nichollet.
30	Camp 4, Oregon trail, about one mile from where it strikes the Wakarusi creek..........	43	43	38 54 08	6 20 08	....	W. H. Emory.
July 4	Camp 8, Big John Spring..........	81	124	38 39 28	6 24 58	....	do
5	Camp 9, Diamond Spring..........	20	144	....	6 26 09	....	do
6	Camp 10, Cotton-wood creek..........	29	173	38 29 30	6 28 07	....	do
	Camp 13, Cow creek..........	58	231				
11	Camp 14, bend of the Arkansas river, where the road strikes it..........	22	253	38 21 17	6 33 28	....	do
13	Camp 16, Pawnee Fork..........	35	288	38 10 10	6 35 41	....	do
19	Camp 20, Jackson Grove..........	64	352	37 41 38	6 38 22	....	do
22	Camp 23, Arkansas, on the river..........	66	418	37 57 39	6 42 29	....	do
25	Camp 26, Arkansas, on the river..........	64	482	38 01 08	6 46 44	....	do
30	Camp 30, Bent's Fort..........	82	564	38 02 53	6 52 04	103 01 00*	do
Aug. 3	Camp 32, on the Timpa..........	34	598	37 44 56	6 54 16	....	do
5	Camp 34, on the Purgatory..........	53	631	37 11 59	6 56 47.9	....	do
6	Camp 35, on the Raton..........	17	668	37 00 21	6 57 01	....	do
7	Camp 36, on the Canadian..........	17	685	36 47 34	6 56 59	....	do

	10	Camp 38, on the Cimmarron Citon....	30	715	36	27	50	6	58	39	104	39	45	do
	12	Camp 40, at the Pools, about one mile west of the road..................	50	765	35	54	21	6	59	49	104	57	15	do
	14	Camp 42, about one mile south of the Vegas...........................	27	792	35	35	05	7	00	46	105	11	30	do
	15	Camp 43, Vernal Springs............	19	811	35	23	19	7	01	23	105	20	45	do
		Camp Santa Fé.....................	62	873	35	41	06	7	04	05.5	106	01	23	do
Sept.	10	Camp on the Rio del Norte, about one mile below San Felippe............	38	911	35	25	30	7	06	16.2	106	34	04	do
	4	Camp on the Rio del Norte, near the Alameda..........................	....	....	35	11	20	7	07	00	106	45	00	do
	6	Camp at Peralta, near Señora Chavis's private chapel.....................	....	....	34	50	57	7	07	08.4	106	47	06	do
	30	Camp 62, a little south of, and about one mile west of Peralta	48	959	34	48	33	7	07	14.2	106	48	33	do
[illegible]	4	Camp 65, west bank of Rio del Norte, about two miles below Lamitar	52	1011	34	07	39	7	07	54	106	58	29	do
	7	Camp 68, west bank of Rio del Norte.	37	1048	33	41	19	7	08	14	107	03	36	do
	9	Camp 70, east bank of Rio del Norte.	....	....	33	20	02	7	08	57	107	04	17	do
	15	Camp 73, first camp after leaving Rio del Norte.........................	68	1116	32	55	04	7	10	25	107	36	15	do
	17	Camp 75, in the mountains, between the Del Norte and copper mines....	38	1154	32	42	11	7	12	00	108	00	00	do
	19	Camp 77, Night creek...............	47	1201	32	50	54	7	14	32	108	38	00	do
	20	Camp 78, first camp on the Rio Gila..	8	1209	32	50	08	7	15	00	108	45	00	do
	22	Camp 80............................	....	....	32	38	13	7	16	30	109	07	30	do
	24	Camp 81, on the Gila	58	1259	32	44	52	7	17	28	109	22	00	do
	26	Camp 83, on the Gila	38	1297	32	53	16	7	18	06.3	109	31	34	do
	30	Camp 86, on the Gila	63	1360	33	12	10	7	21	23	110	20	46	do
	31	Camp 87, on the San Francisco, about two miles from its mouth	9	1369	33	14	29	7	22	01.6	110	30	24	do
Nov.	2	Camp 89, Disappointment creek......	21	1390	33	14	54	7	23	00.4	110	45	06	do
	5	Camp 91, on the San Pedro, near its mouth............................	38	1428	32	57	43	7	23	19.5	110	49	53	do
	8	Camp 93, on the Gila................	29	1457	33	05	40	7	24	52.6	111	13	10	do
	10	Camp 95, on the Gila	37	1494	33	04	21	7	27	03.8	111	45	58	do
	12	Camp 97, between Pimos and Coco Maricopas villages..................	23	1517	33	09	28	7	28	28.8	112	07	13	do
	14	Camp 99, on the Gila................	44	1561	32	59	22	7	31	20	112	50	01	do
	17	Camp 101, on the Gila	39	1600	32	55	52	7	33	41.6	113	25	25	do
	19	Camp 103, on an island in the Gila...	39	1639	32	43	38	7	35	50.7	113	57	41	do

APPENDIX No. 4.—GEOGRAPHICAL POSITIONS—Continued.

Date.	Places of observation.	Distances measured by the viameter.		North latitudes.	West of Greenwich.		Authorities.
		Distance from camp to camp.	Total distance from Fort Leavenworth.		In time.	In arc.	
1846.				° ′ ″	H. M. S.	° ′ ″	
Nov. 21	Camp 105, on the Gila	26	1665	32 43 17	7 37 22.8	114 20 43	W. H. Emory.
22	Camp 106, about one mile and a half south of the junction of the Gila and Colorado of the west	22	1687	32 42 09	7 38 28.6	114 37 09	do
25	First camp after leaving the Rio Colorado	22	1709	32 40 22	7 39 45.8	114 56 28	do
28	Camp 111, Cariso creek	77	1786	32 52 33	7 44 24.6	116 06 09	do
29	Camp 112, Valle Citon	16	1802	32 58 15	7 45 22.7	116 20 40	do
Dec. 2	Camp 114, a few hundred yards south of Warner's rancheria	35	1837	33 16 57	7 46 34.8	116 38 43	do
7	Camp 118, battle ground of the 7th	50	1887	33 03 42	7 48 14	117 03 29	do
	San Diego, (public square)	29	1916	32 45 00	7 48 44	117 11 00	Latitude by W. H. Emory. Longitude by Sir Ed. Belcher.

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* NOTE.—This longitude of Bent's Fort is the result of the improved method of computation adopted by Professor Hubbard.* The longitude, deduced by me from the same data, and communicated to the Chief of the Bureau of Topographical Engineers in an official report, dated Santa Fé, September 1, 1846, was 103° 25′ 45″. As this longitute was published at the time by the bureau, this explanation becomes necessary. My confidence in Professor H. induces me to adopt his determination. It is the only point where any great difference exists.
W. H. E.

APPENDIX No. 5.

TABLE

OF

ASTRONOMICAL OBSERVATIONS.

APPENDIX No. 5.

ASTRONOMICAL OBSERVATIONS.

NOTE.—The lunar distances were reduced by Professor Hubbard, by Bessel's method, which is presumed to be the most accurate method known. The important changes made in the longitude of one or two leading positions, must, therefore, depend for authentication upon the observations themselves.

These observations have not, in all cases, been multiplied to the extent desired, owing to the nature of the service on which the undersigned was employed; but there is no reason on the face of them for doubting the results deduced.

W. H. EMORY.

June 21, 1846.—*Fort Leavenworth.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of α Lyræ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	01	46.5	102	00	20	6	53	14.9
4	04	52	103	09	35	6	53	14.8
4	06	15.2	103	40	30	6	53	15.4
4	07	30.0	104	08	20	6	53	15.7
4	08	27.1	104	29	35	6	53	16.0
4	09	56.7	105	02	30	6	53	17.6
4	11	18.5	105	33	30	6	53	16.6
4	12	46.2	106	07	20	6	53	14.1
4	13	57.3	106	53	35	6	53	15.0
4	15	59	107	18	40	6	53	16.7

Thermometer 60°.

APPENDIX No. 5—Continued.

June 21, 1846.—*Fort Leavenworth.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	27	39.8	126	57	50	6	53	19.2
4	29	18.0	126	08	10	6	53	17.4
4	30	32.0	125	46	50	6	53	20.2
4	32	30.2	125	10	20	6	53	18.5
4	33	59.1	124	44	00	6	53	20.2
4	35	31.5	124	14	40	6	53	17.0
4	37	14.7	123	43	00	6	53	18.1
4	38	52.8	123	12	05	6	53	17.2
4	40	35.3	122	41	15	6	53	21.9 rej.
4	42	17.0	122	08	00	6	53	18.7

Thermometer 60°.

	h.	*m.*	*s.*
Chronometer fast by 10 obs. of east star...........	6	55	15.68
Chronometer fast by 9 obs. of west star............			18.50
Mean.................................	6	53	17.09

DETERMINATION OF INDEX ERROR.

	m.	*s.*
Off the arc..	31	50
On the arc..	31	10

Index error = + 20″.

APPENDIX No. 5—Continued.

June 21, 1846.—Fort Leavenworth.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	59	03.0	76	36	40	39	21	29
5	01	02.2	76	37	55	39	21	34
5	03	28.6	76	38	55	39	21	22
5	05	13.5	76	40	50	39	21	24
5	06	50.3	76	41	05	39	21	28
5	08	22.5	76	41	45	39	21	23
5	09	50.8	76	42	30	39	21	10
5	11	12.2	76	43	50	39	21	27
5	12	29.6	76	44	35	39	21	36
5	13	55.0	76	45	20	39	21	33
5	15	18.8	76	46	20	39	21	39
5	16	44.7	76	47	10	39	21	36
5	18	15.0	76	48	20	39	21	45
5	19	41.8	76	48	40	39	21	28
5	21	23.5	76	49	50	39	21	32
5	23	06.0	76	51	10	39	21	42

Mean of 16 observations, 39° 21′ 30″.

APPENDIX No. 5—Continued.

June 21, 1846.—*Fort Leavenworth.*

DETERMINATION OF TIME.

Time, a.m.—June 22.			Double altitudes of sun's upper limb.		Time, p. m.—June 21.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
5	05	42.0	125	50	8	45	51.8	6	53	17.8
5	03	15.8	123	40	8	46	19.8	6	53	18.23
5	02	46.0	123	30	8	46	49.7	6	53	18.33
5	02	17.0	123	20	8	47	17.0	6	53	17.48
	Lost.		123	10	8	47	46.0			
5	01	19.2	123	00	8	48	15.1	6	53	17.58
5	00	51.5	122	50	8	48	43.5	6	53	17.53
5	00	23.5	122	40		Lost.				
4	59	54.5	122	30	8	49	39.7	6	53	17.58
			122	20	8	50	08.5			
			122	10	8	50	36.2			
			122	00	8	51	06.0			

NEW SERIES.

3	47	37.5	95	40	10	01	57.5	6	53	17.96
3	47	11.5	95	30	10	02	24.0	6	53	18.21
3	46	44.2	95	20	10	02	50.2	6	53	17.66
3	46	18.5	95	10	10	03	15.5	6	53	17.46
3	45	52.5	95	00	10	03	41.5	6	53	17.46
3	45	26.8	94	50	10	04	08.3	6	53	18.01
3	45	11.0	94	40	10	04	34.1	6	53	18.01
3	44	34.0	94	30	10	05	00.0	6	53	17.46
3	44	08.5	94	20	10	05	26.2	6	53	17.81
3	41	57.5	93	30	10	07	38.2	6	53	18.31
3	41	32.5	93	20	10	08	03.0	6	53	18.21
3	41	15.3	93	10	10	08	28.0	6	53	17.11
3	40	39.5	93	00	10	08	55.2	6	53	17.81
3	40	14.2	92	50	10	09	21.0	6	53	18.06
	Lost.		92	40	10	09	47.0			
3	39	21.5	92	30	10	10	11.9	6	53	17.16
	Ther. 60°					Ther. 75°				

Mean of 22 observations, 6*h*. 53*m*. 17.76*s*

APPENDIX No. 5—Continued.

June 22, 1846.—Fort Leavenworth.

DETERMINATION OF TIME.

Time, a. m.			Double altitudes of sun's upper limb.		Time, p. m.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
3	48	02.5	95	50	10	01	42.5	6	53	16.69
3	47	37.5	95	40	10	02	08.2	6	53	17.04
3	47	11.5	95	30	10	02	33.5	6	53	16.69
3	46	44.2	95	20	10	02	59.1	6	53	15.84
3	46	18.5	95	10	10	03	26.5	6	53	16.69
3	45	52.5	95	00	10	03	52.0	6	53	16.44
3	45	26.8	94	50	10	04	18.0	6	53	16.59
3	45	01.0	94	40	10	04	45.1	6	53	17.24
3	44	35.0	94	30	10	05	11.0	6	53	17.19
3	44	08.5	94	20	10	05	36.8	6	53	16.84
Lost.			94	10	10	06	2.3			
Lost.			94	00	10	06	28.5			
3	41	57.5	93	30	10	07	45.8	6	53	15.84
3	41	32.5	93	20	10	08	11.8	6	53	16.34
3	41	05.3	93	10	10	08	38.8	6	53	16.24
3	40	39.5	93	00	10	09	05.0	6	53	16.44
3	40	14.2	92	50	10	09	30.2	6	53	16.29
Ther. 68°					Ther. 74°					

Mean of 15 observations, 6*h*. 53*m*. 16.52*s*.

APPENDIX No. 5—Continued.

June 24, 1846.—Fort Leavenworth.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Lyræ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h*	*m.*	*s.*
4	26	24.0	115	45	10	6	53	06.2
4	27	37.8	116	13	05	6	53	06.0
4	29	38.0	116	58	30	6	53	06.6
4	30	55.7	117	27	55	6	53	06.7
4	32	37.5	118	06	40	6	53	06.3
4	33	58.2	118	37	10	6	53	06.7
4	35	33.7	119	13	45	6	53	05.9
4	37	47.0	120	04	25	6	53	05.9
4	39	30.2	120	44	05	6	53	04.7

Thermometer 66°.

Time, p. m.			Double altitudes of Aroturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	44	52.0	117	22	50	6	53	11.5
4	46	47.5	116	44	55	6	53	14.6 rej.
4	48	19.0	116	13	00	6	53	11 8
4	50	06.8	115	35	35	6	53	09.8
4	54	31.5	114	04	40	6	53	09.7
4	55	58.5	113	34	30	6	53	09.8
4	57	14.2	113	09	10	6	53	14.3 rej.
4	58	38.5	112	38	40	6	53	09.3
5	00	26.7	112	01	45	6	53	12.0
5	02	05.0	111	27	25	6	53	12.2

Barometer 39.52 Thermometer 64°.
34.57

	h.	*m.*	*s.*
Chronometer fast by 9 obs. of east star...........	6	53	06.58
Chronometer fast by 8 obs. of west star...........			10.76
Mean..................................	6	53	08.67

APPENDIX No. 5—Continued.

June 25, 1846.—*Fort Leavenworth*.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of sun's upper limb.		Time, a. m.—June 26.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
10	08	34.5	93	20	3	42	24.5	6	53	07.09
10	09	00.0	93	10	3	41	59.5	6	53	07.35
10	10	44.2	92	30	3	40	16.0	6	53	07.31
10	11	10.2	92	20	3	39	48.5	6	53	06.71
10	11	36.5	92	10						
10	12	02.8	92	00	3	38	58.0	6	53	08.02
10	14	38.0	91	00	3	36	20.5	6	53	06.88
10	17	14.2	90	00	3	33	44.0	6	53	06.73
10	17	40.0	89	50						
Ther. 78°					Ther. 74°					

Barometer, 39.50.
34.48.

Mean of 7 observations, 6*h*. 53*m*. 07.16*s*.

June 26, 1846.—*Fort Leavenworth*.

DETERMINATION OF TIME.

Time, a. m.			Double altitudes of sun's upper limb.		Time, p. m.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
3	38	58.0	92	00	10	12	07.0	6	53	05.97
Lost.			92	10	10	11	41.2			
3	39	48.0	92	20	10	11	14.2	6	53	04.57
3	40	15.0	92	30	10	10	48.2	6	53	05.07
3	40	40.8	92	40	10	10	22.5	6	53	05.12
3	41	09.2	92	50	10	09	57.5	6	53	06.32
3	41	33.0	93	00	10	09	30.2	6	53	05.07
3	41	59.5	93	10	10	09	04.2	6	53	05.31
3	42	24.5	93	20	10	08	40.3	6	53	05.86
3	42	50.8	93	30	10	08	10.8	6	53	05.76
3	43	16.5	93	40	Lost.					
3	44	42.0	93	50	10	07	21.2	6	53	05.06
3	45	10.2	94	00	10	06	54.5	6	53	05.81
Ther. 74°					Ther. 80°					

Mean of 11 observations, 6*h*. 53*m*. 05.45*s*.

APPENDIX No. 5—Continued.

June 26, 1846.—*Fort Leavenworth, N. W. angle of square.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *a* Ophiuchi, near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	29	57.5	94	36	40	39	21	12
4	31	35.8	94	39	20	39	21	00
4	33	00.0	94	40	30	39	21	12
4	34	14.0	94	41	50	39	21	07
4	35	47.9	94	42	50	39	21	11
4	37	20.0	94	43	40	39	21	08
4	38	51.2	94	44	10	39	21	06
4	40	19.7	94	44	15	39	21	05
4	42	05.0	94	43	25	39	21	20
4	43	35.5	94	42	30	39	21	27
4	45	03.8	94	41	50	39	21	18
4	46	19.0	94	40	40	39	21	18
4	48	10.0	94	38	25	39	21	27
4	49	25.2	94	37	10	39	21	15
4	50	39.8	94	34	30	39	21	38
4	52	01.2	94	32	15	39	21	35
4	53	35.8	94	29	10	39	21	37

Thermometer 64°.

Mean of 17 observations, 39° 21′ 17″.

APPENDIX No. 5—Continued.

June 26, 1846.—*Fort Leavenworth.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	58	46.5	76	47	45	39	21	21
5	00	03.2	76	48	40	39	21	24
5	01	37.2	76	49	50	39	21	30
5	02	50.8	76	50	20	39	21	23
5	03	59.0	76	51	20	39	21	31
5	05	07.2	76	52	10	39	21	35
5	06	12.1	76	53	05	39	21	42
5	07	55.2	76	53	40	39	21	29
5	09	20.0	76	54	50	39	21	38
5	10	27.1	76	55	35	39	21	39
5	11	19.8	76	56	05	39	21	37

Barometer, 39.42 inches.
"   34.41   "

Thermometer 64°.

Mean of 11 observations, 39° 21′ 33″.

APPENDIX No. 5—Continued.

[Without using horizon glass.

June 26, 1846.—*Fort Leavenworth.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *a* Ophiuchi, near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	49	39.8	126	23	20	39	20	01
5	51	37.8	126	28	40	39	20	00
5	52	20.2	126	32	55	39	20	19
5	54	26.0	126	35	05	39	20	00
5	56	40 7	126	38	20	39	20	48
5	58	38.6	126	38	40	39	21	06
6	00	57.0	126	40	50	39	20	44
6	02	39.2	126	39	55	39	21	05
6	04	05.4	126	38	15	39	21	36
6	06	34.0	126	36	45	39	21	16
6	07	55.1	126	34	20	39	21	55
6	09	18.7	126	33	05	39	21	15
6	10	21.2	126	29	50	39	19	45
6	11	43.5	126	27	20	39	19	32
6	13	23.2	126	23	45	39	20	16

Thermometer 63°.

Barometer, 39.42.
34.41.

Mean of 15 observations, 39° 20′ 37″.

	Latitude of fort, N. W. angle of square.		
	Deg.	*m.*	*s.*
Latitude by 16 observations of Polaris, June 21..	39	21	30
" 11 " Polaris, June 26..		21	32
" 17 " *a* Ophiuchi, June 26		21	17
" 15 " *a* Ophiuchi, June 26		20	37
Mean......................	39	21	14

APPENDIX No. 5—Continued.

June 26, 1846.—Fort Leavenworth.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of —— in the east.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
6	21	08.0	117	18	45
6	22	49.0	117	55	10
6	25	23.5	118	42	15
6	27	06.0	119	25	50
6	28	20.0	119	52	10
6	31	13.2	120	53	50
6	32	11.0	121	13	00
6	33	17.5	121	38	25
6	34	41.0	122	08	05

Barometer, 39.42.
34 41.

Thermometer, 60°.

So much noise from the barracks, that I have no confidence in these observations.

APPENDIX No. 5—Continued.

June 27, 1846.—Fort Leavenworth.

DETERMINATION OF TIME.

Time, a. m.—June 21.			Double altitudes of sun's upper limb.		Time, p. m.—June 26.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
3	39	19.0	92	00	10	12	07.0	6	52	06.09
3	39	40.0	92	10	10	11	41.2	6	52	06.63
3	40	04.8	92	20	10	11	14.2	6	52	05.63
3	40	32.0	92	30	10	10	48.2	6	52	06.13
3	40	57.2	92	40	10	10	22.5	6	52	05.88
3	41	22.8	92	50	10	09	57.5	6	52	06.18
3	41	47.7	93	00	10	09	30.2	6	52	04.98 rej.
3	42	16.0	93	10	10	09	04.2	6	52	06.15
3	42	41.0	93	20	10	08	40.3	6	52	06.68
3	43	07.8	93	30	10	08	13.8	6	52	06.83
3	43	32.6	93	40	Lost.					
3	44	00.0	93	50	10	07	21.2	6	52	06.63
3	44	24.8	94	00	10	06	54.5	6	52	05.68

Mean of 11 observations, 6*h*. 52*m*. 06 22*s*.

APPENDIX No. 5—Continued.

June 30, 1846.—*Camp No.* 4.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *a* Serpentis, near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	49	20.8	115	59	10	38	53	54
3	50	36.8	116	00	10	38	54	05
3	51	41.7	116	01	15	38	53	59
3	52	52.0	116	02	05	38	53	58
3	54	01.0	116	02	45	38	53	53
3	55	32.7	116	02	55	38	53	54
3	56	55.8	116	02	45	38	53	55
3	58	04.5	116	01	40	38	54	15
3	59	04.8	116	01	25	38	53	50
4	00	46.0	116	00	00	38	54	07
4	02	03.1	115	58	31	38	54	10
4	03	20.0	115	56	50	38	54	08
4	04	33.0	115	53	40	38	53	45

The four last observations rather doubtful; musquitos so very troublesome.

Mean of 13 observations, 38° 53′ 59″.

APPENDIX No. 5—Continued.

June 30, 1846.—*Camp. No.* 4.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	13	42.0	75	35	50	38	54	00
4	15	19.8	75	37	30	38	54	23
4	16	36.0	75	38	30	38	54	33
4	17	58.2	75	39	05	38	54	27
4	19	27.7	75	39	50	38	54	27
4	20	50.0	75	40	00	38	54	09
4	22	02,8	75	40	40	33	54	08
4	23	00.0	75	41	25	38	54	13
4	24	34.2	75	42	20	38	54	16
4	26	28.5	75	43	15	38	54	14
4	27	48.7	75	43	55	38	54	10

Thermometer, 67°.

	Deg.	*min.*	*sec.*	
Latitude by 13 observations of Polaris,	38	54	18	
Latitude by 13 observations of *a* Serpentis,		53	59	
Mean	38	64	08	lat. of camp.

APPENDIX No. 5—Continued.

June 30, 1846.—*Camp* 4.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *α* Lyræ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	30	19.1	102	54	10	6	54	05.5
3	32	16.0	103	37	55	6	54	05.3
3	33	51.0	104	13	30	6	54	00.3 rej.
3	34	54.2	104	38	05	6	54	03.3
3	36	21.5	105	09	55	6	54	06.0
3	37	29.8	105	35	50	6	54	05.0
3	38	49.0	106	05	15	6	54	06.4

Thermometer, 68°.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	33	00.0	114	07	30	6	54	12.9
4	34	16.0	113	40	40	6	54	12.7
4	35	28.7	113	15	00	6	54	12.3
4	36	44.0	112	48	30	6	54	12.4
4	37	49.0	112	24	55	6	54	11.0
4	39	03.5	111	59	20	6	54	13.4
4	40	18.7	111	32	30	6	54	16.1 rej.
4	41	47.0	111	01	10	6	54	14.0
4	42	38.2	110	42	20	6	54	12.5
4	44	34.0	110	00	00	6	54	10.2
4	45	48.5	109	33	50	6	54	12.1

Thermometer, 66°.

	h.	*m.*	*s.*
Chronometer fast by 6 obs. of east star...........	6	54	05.30
Chronometer fast by 10 obs. of west star.........			12.55
Mean...	6	54	8.82

APPENDIX No. 5—Continued.

July 4, 1846.—*Camp* 8, *Big John Spring.*

DETERMINATION OF TIME.

Time, p. m.			Double altitude of sun's upper limb.		Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*
10	33	24.2	86	10	6	58	49.7
10	33	50.8	86	00	6	58	50.6
10	34	17.0	85	50	6	58	51.0
10	34	41.8	85	40	6	58	50.3
10	35	08.2	85	30	6	58	51.1
10	35	33.7	85	20	6	58	50.9
10	35	59.0	85	10	6	58	50.6
10	36	25.8	85	00	6	58	51.7
10	36	40.2	84	50	6	58	49.4
10	37	17.0	84	40	6	58	51.6
10	37	42.0	84	30	6	58	51.0
10	38	08.5	84	20	6	58	51.8
10	38	38.2	84	10	6	58	52.9
10	38	58.7	84	00	6	58	50.7

Thermometer, 88°.

Mean of 14 observations, 6*h*. 58*m*. 50.96*s*.

APPENDIX No. 5—Continued.

July 5, 1846.—*Camp* 8, *Big John Spring.*

DETERMINATION OF TIME.

Time, a. m.			Double altitudes of *a* Aquilæ in the west.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
10	31	28.0	85	48	40	6	58	47.9	
10	32	30.8	85	28	30	6	58	50.8	
10	33	37.0	85	04	20	6	58	46.6	
10	34	57.9	84	36	05	6	58	47.4	
10	36	25.8	84	06	35	6	58	47.9	
10	38	06.2	83	31	25	6	58	46.8	
10	39	10.0	83	09	35	6	58	47.9	
10	40	09.7	82	48	30	6	58	47.0	
10	41	04.5	82	28	40	6	58	44.9	rej.
10	42	03.2	82	08	30	6	58	46.0	

Mean of 9 observations, 6*h*. 58*m*. 47.59*s*.

APPENDIX No. 5—Continued.

July 5, 1846.—*Camp* 8, *Big John Spring.*

DETERMINATION OF LATITUDE.

Time, a. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
10	03	11.0	79	24	45	38	39	50
10	04	43.8	79	25	50	38	39	55
10	06	16.7	79	26	25	38	39	44
10	07	31.0	79	27	20	38	39	52
10	09	20.0	79	28	20	38	39	53
10	11	54.0	79	29	50	38	39	54

Time, a. m.			Double altitude of Saturn, near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
10	16	59.0	77	13	20	38	38	43
10	18	39.9	77	12	55	38	38	59
10	19	46.2	77	12	15	38	39	16
10	21	37.3	77	11	55	38	39	10
10	22	52.0	77	11	30	38	39	05
10	24	01.8	77	10	35	38	39	11
10	25	29.2	77	09	00	38	39	10
10	26	49.0	77	08	05	38	39	11

Thermometer 75°.

	Latitude of camp.		
	Deg.	*min.*	*sec.*
Latitude by 6 observations of Polaris..............	38	39	51
" 8 " " Saturn			06
Mean.........................	38	39	28

APPENDIX No. 5—Continued.

July 5, 1846.—*Camp* 9, *Diamond Spring.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	53	40.0	74	58	35	38	36	52
3	55	03.2	74	59	10	38	36	48
3	56	33.0	75	00	15	38	36	58
3	58	06.5	75	00	55	38	36	54
3	59	11.0	75	01	40	38	36	58
4	00	05.0	75	02	00	38	36	54
4	01	07.0	75	02	35	38	36	56
4	01	59.0	75	03	00	38	36	54
4	03	13.5	75	03	35	38	36	53
4	04	35.7	75	04	35	38	36	57
4	10	58.0	75	07	25	38	36	57
4	12	00.0	75	08	20	38	36	49
4	13	07.2	75	09	25	38	36	49
4	14	56.0	75	09	55	38	36	50
4	15	56.2	75	10	40	38	36	51

Thermometer 72°.

Mean of 16 observations, 38° 36'' 52'.

APPENDIX No. 5—Continued.

July 5, 1846.—Camp 9, Diamond Spring.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	26	57.2	106	40	45	6	59	54.8
3	28	49.8	107	21	55	6	59	58.4
3	29	55.7	107	47	20	6	59	57.0
3	30	45.0	108	07	25	6	59	53.2
3	32	32.0	108	47	10	6	59	54.9
3	33	39.7	109	11	55	6	59	57.2
3	34	38.2	109	32	50	6	59	60.4
3	35	34.0	109	55	40	6	59	56.0
3	36	31.5	110	17	40	6	59	55.4
3	37	24.7	110	37	40	6	59	55.8
3	38	47.5	111	9	00	6	59	55.9

Thermometer 72°.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	20	57.0	113	44	20	6	59	60.8
4	22	02.0	113	21	15	6	59	60.9
4	23	07.8	112	52	35	6	59	60.2
4	24	16.0	112	33	15	6	59	60.2
4	25	20.8	112	10	00	6	59	60.0
4	26	09.7	111	52	35	6	59	60.4
4	27	10.7	111	30	25	6	59	59.5
4	28	11.0	111	08	30	6	59	58.9
4	29	33.8	110	38	55	6	59	59.8

Thermometer 71°.

	h.	*m.*	*s.*
Chronometer fast by 11 observations of east star	6	59	56.27
“ “ 9 “ west star			60.08
Mean..........................	6	59	58.18

APPENDIX No. 5—Continued.

July 6, 1846—*Camp* 10, *Cotton-wood Grove.*

DETERMINATION OF TIME.

Time p. m.			Double altitudes of *a* Lyræ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	05	32.8	122	05	00	7	01	54.0
4	06	40.0	122	31	55	7	01	57.0
4	07	59.5	123	01	10	7	01	54.3
4	09	07.0	123	27	55	7	01	52.0
4	10	21.8	123	56	55	7	01	51.1
4	11	45.8	124	28	15	7	01	53.7
4	13	04.5	124	59	20	7	01	51.5
4	14	24.0	125	29	50	7	01	51.7

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	19	30.0	113	37	55	7	01	56.5
4	20	52.8	113	07	50	7	01	54.9
4	22	43.2	112	28	15	7	01	54.8
4	24	04.3	111	59	15	7	01	55.2
4	25	25.2	111	30	35	7	01	56.6
4	27	26.5	110	45	50	7	01	54.1
4	29	40.0	109	57	55	7	01	55.8
4	32	42.8	108	51	10	7	01	55.5
4	34	54.0	108	13	40	7	01	57.1
4	35	46.2	107	44	15	7	01	56.6
4	38	05.8	106	52	55	7	01	55.8
4	39	14.0	106	26	55	7	01	54.6

Thermometer 72°.

	h.	*m.*	*s.*
Chronometer fast by 8 observations of east star	7	01	52.4
" " 12 " west star			55.2
Mean.........................	7	01	54.03

APPENDIX No. 5—Continued.

July 6, 1846.—*Camp* 10, *Cotton-wood Grove.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitude of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	49	21.0	75	17	45	38	29	44
4	53	05.0	75	19	35	38	29	25
4	54	07.0	75	20	35	38	29	35
4	55	26.2	75	21	35	38	29	35
4	56	58.3	75	22	10	38	29	25
4	58	07.0	75	22	35	38	29	12
4	59	31.0	75	23	50	38	29	26
5	01	14.7	75	25	20	38	29	35
5	02	28.7	75	26	10	38	29	38
5	03	46.0	75	27	05	38	29	37

Thermometer, 71°

July 7, 1846.—*Camp* 10.

Time, p. m.			Double altitude of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	16	45.0	74	59	45	38	29	31
4	19	27.5	75	01	05	38	29	22
4	20	16.0	75	01	40	38	29	27

Thermometer 68°.

	Deg.	*min.*	*sec.*
Latitude by 10 obs. of Polaris, July 6..............	38	29	31
Latitude by 3 obs. of Polaris, July 7..............			27
Mean of 13 observations..............................	38	29	30

APPENDIX No. 5—Continued.

July 7, 1846—*Camp* 10, *Cotton-wood Grove.*

DETERMINATION OF TIME.

Time, a. m.			Double altitude of sun's upper limb.		Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*
4	01	24.2	95	50	7	01	50.3
4	01	50.4	96	00	7	01	50.7
4	02	16.3	96	10	7	01	50.8
4	02	41.8	96	20	7	01	50,4
4	03	07.0	96	30	7	01	49.8
4	03	58.8	96	50	7	01	49.9
4	04	50.8	97	10	7	01	50.3
4	05	17.0	97	20	7	01	50.5
4	05	42.7	97	30	7	01	50.4
4	06	08.7	97	40	7	01	50.5
4	06	34.0	97	50	7	01	49.9
4	06	59.6	98	00	7	01	49.6

Thermometer, 88°.

Mean of 12 observations, 7*h.* 01*m.* 50.26*s.*

APPENDIX No. 5—Continued.

July 7, 1846.—*Camp* 10, *Cotton-wood Grove.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of sun's upper limb.		Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*
10	17	49.0	93	20	7	01	54.0
10	18	14.5	93	10	7	01	53.6
10	18	38.8	93	00	7	01	52.4
10	19	05.1	92	50	7	01	52.8
10	19	31.0	92	40	7	01	53.1
10	19	57.0	92	30	7	01	53.4
10	20	47.5	92	10	7	01	52.4
10	21	13.5	92	00	7	01	52.7
10	21	39.2	91	50	7	01	52.7
10	22	08.0	81	40	7	01	52.8
10	22	30.0	91	30	7	01	52.1
10	22	56.5	91	20	7	01	52.9
10	23	21.8	91	10	7	01	52.5
10	23	48.0	91	00	7	01	53.0

Thermometer, 90°.

Mean of 14 observations, 7*h.* 01*m.* 53.10*s.*

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	04	16.8	117	33	55	7	01	50.4
4	05	24.5	117	11	5	7	01	52.4
4	06	46.0	116	42	20	7	01	51.2
4	07	32.0	116	26	40	7	01	52.5
4	09	54.0	115	36	55	7	01	52.7

Mean of 5 observations, 7*h.* 01*m.* 51.84*s.*

APPENDIX No. 5—Continued.

July 11, 1846.—*Camp* 14, *Bend of Arkansas.*

Time, p. m.			Double altitudes of α Lyræ in the east.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
3	26	08.0	112	31	05	7	07	01.8	
3	27	04.0	112	52	20	7	07	02.0	
3	28	05.8	113	15	10	7	07	03.8	
9	29	04.7	113	38	10	7	07	02.3	
3	30	34.0	114	13	10	7	06	59.7	rej.
3	31	35.2	114	35	05	7	07	03.4	
3	32	41.0	114	59	50	7	07	04.2	
3	34	12.0	115	35	10	7	07	02.8	
3	35	03.2	115	54	40	7	07	02.9	
3	36	01.2	116	16	40	7	07	03.2	
3	37	02.0	116	40	15	7	07	02.1	
3	38	06.2	117	05	10	7	06	59.4	rej.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	41	09.1	121	59	55	7	07	05.0
3	42	10.7	121	39	20	7	07	04.8
3	43	37.5	121	10	25	7	07	05.5
3	44	41.8	120	48	40	7	07	05.4
3	45	38.0	120	29	30	7	07	04.9
3	47	01.0	120	01	25	7	07	05.2
3	47	58.8	119	41	15	7	07	04.0
3	49	01.8	119	19	40	7	07	02.9
3	50	05.5	118	57	30	7	07	03.0
3	51	02.2	118	38	10	7	07	03.7
3	52	00.3	118	18	10	7	07	03.9
3	53	01.5	117	57	15	7	07	04.7

Thermometer, 71°.

	h.	*m.*	*s.*
Chronometer fast by 10 obs. of east star..........	7	07	02.85
Chronometer fast by 12 obs. of west star			04.42
Mean..	7	07	03.64

APPENDIX No. 5—Continued.

July 11, 1846.—*Camp* 14, *Bend of Arkansas.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitude of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	16	18.0	74	48	40	38	21	02
4	17	27.8	74	49	55	38	21	19
4	18	52.5	74	50	30	38	21	09
4	20	33.0	74	51	25	38	21	05
4	21	26.1	74	52	10	38	21	11
4	22	30.5	74	52	40	38	21	07
4	23	55.5	74	53	30	38	21	05
4	24	56.2	74	54	40	38	21	21
4	25	45.0	74	55	10	38	21	21
4	26	24.2	74	55	40	38	21	24
4	27	35.1	74	56	00	38	21	12
4	28	53.0	74	57	20	38	21	27
4	30	07.5	74	57	55	38	21	21
4	31	24.2	74	59	05	38	21	31
4	33	57.0	74	59	55	38	21	10
4	34	52.2	75	01	05	38	21	25
4	36	20.5	75	01	50	38	21	19
4	37	01.0	75	02	20	38	21	24
4	37	45.1	75	02	45	38	21	19
4	39	00.0	75	03	20	38	21	10

Thermometer, 71°.

Mean of 20 observations, 38° 21′ 16″.

APPENDIX No. 5—Continued.

July 11, 1846.—*Camp* 14, *Bend of Arkansas.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *a* Ophiuchi, near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	44	10.7	126	45	25	38	20	48
4	46	13.1	126	58	40	38	20	27
4	48	04.5	127	11	00	38	20	32
4	50	14.7	127	23	20	38	21	02
4	51	54.8	127	33	00	38	21	01
4	53	50.8	127	43	10	38	21	06
4	56	01.0	127	53	40	38	21	08
5	00	44.0	128	12	30	38	21	21
5	02	12.8	128	17	25	38	21	34
5	03	58.2	128	23	15	38	21	16
5	05	13.0	128	26	50	38	20	58
5	06	41.5	128	30	00	38	21	06
5	08	21.7	128	33	25	38	21	03
5	09	29.5	128	35	40	38	20	51
5	10	39.6	128	37	10	38	20	54
5	12	17.0	128	38	10	38	21	12
5	13	17.5	128	38	55	38	21	16
5	14	45.0	128	39	45	38	21	15
5	16	07.0	128	39	20	38	21	21
5	18	10.2	128	38	55	38	21	27
5	19	15.7	128	37	40	38	21	46
5	20	21.0	128	36	30	38	20	52
5	21	17.0	128	35	50	38	20	42
5	22	40.2	128	33	10	38	21	05
5	24	12.1	128	31	45	38	21	29
5	25	24.5	128	28	50	38	21	44
5	26	29.7	128	27	00	38	21	24
5	27	34.6	128	24	40	38	21	12

Thermometer 71°.

	Latitude of camp.		
	Deg.	*[illegible]n.*	*sec.*
Latitude by 28 observations of *a* Ophiuchi.........	38	21	18
" 20 " Polaris...........			16
Mean...........................	38	21	17

APPENDIX No. 5—Continued.

July 13, 1846.—*Camp* 16, *Pawnee Fork.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ, in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	26	32.1	114	44	50	7	09	12.9
3	27	51.3	115	15	40	7	09	11.5
3	28	56.2	115	40	15	7	09	11.9
3	29	54.0	116	02	05	7	09	12.7
3	31	22.0	116	36	15	7	09	10.3
3	32	41.7	117	05	50	7	09	13.8
3	33	54.9	117	34	20	7	09	12.6
3	34	55.6	117	57	30	7	09	12.7
3	36	00.0	118	22	45	7	09	11.2

Thermometer 72°.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	44	26.2	119	06	55	7	09	12.1
3	45	39.5	118	41	15	7	09	11.5
3	46	44.0	118	19	20	7	09	12.9
3	47	55.7	117	54	15	7	09	12.8
3	49	09.0	117	28	10	7	09	11.5
3	50	19.7	117	14	00	7	09	13.4
3	52	44.9	116	12	50	7	09	13.4
3	54	24.0	115	37	45	7	09	13.5
3	55	40.9	115	10	20	7	09	13.4

Thermometer 71°.

	h.	*m.*	*s.*
Chronometer fast by 9 observations of east star	7	09	12.18
Chronometer fast by 9 observations of west star			12.74
Mean	7	09	12.46

APPENDIX No. 5—Continued.

July 13, 1846.—*Camp* 16, *Pawnee Fork.*

Time.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	24	21.0	74	35	30	38	10	10
4	25	35.9	74	36	10	38	10	06
4	26	38.4	74	36	50	38	10	06
4	27	25.8	74	37	20	38	10	04
4	28	35.2	74	38	05	38	10	06
4	29	20.8	74	38	40	38	10	09
4	30	14.6	74	39	15	38	10	09
4	31	16.0	74	39	50	38	10	08
4	32	06.0	74	40	30	38	10	13
4	32	43.0	74	41	00	38	10	13
4	34	06.8	74	41	55	38	10	17
4	34	54.2	74	42	40	38	10	20
4	35	35.0	74	43	15	38	10	24

Thermometer 70°.

July 14, 1846.—*Camp* 16, *Pawnee Fork.*

Time.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Dec.*	*min.*	*sec.*
4	39	43.5	74	47	55	38	10	05
4	41	00.0	74	48	55	38	10	07
4	42	05.8	74	49	50	38	10	11
4	43	12.2	74	50	30	38	10	08
4	43	56.5	74	51	30	38	10	23

	Latitude of Camp.		
	Deg.	*min.*	*sec.*
Latitude, by 5 observations, July 14.............	38	10	10
Latitude, by 5 observations, July 13.............			16
Mean	38	10	11

APPENDIX No. 5—Continued.

July 14, 1846.—*Camp* 16, *Pawnee Fork.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	32	15.8	118	28	15	7	09	08.5
3	33	39.4	119	00	25	7	09	08.5
3	34	34.0	119	21	50	7	09	07.0
3	35	33.0	119	44	25	7	09	07.1
3	36	28.8	120	04	20	7	09	11.0 rej.
3	37	37.0	120	32	40	7	09	05.4 rej.
3	38	49.3	120	59	28	7	09	08.0
3	39	47.0	121	21	20	7	09	08.6
3	41	07.2	121	52	05	7	09	08.8

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	20	02.3	104	47	45	7	09	11.8
4	21	03.8	104	23	55	7	09	09.8
4	21	50.8	104	06	20	7	09	09.9
4	22	31.6	103	50	55	7	09	09.7
4	23	41.0	103	25	30	7	09	11.5
4	24	55.0	102	57	15	7	09	07.6 rej.
4	25	58.7	102	33	30	7	09	11.2
4	26	57.5	102	11	50	7	09	11.1
4	28	05.0	101	45	20	7	09	10.1

Thermometer 71°.

	h.	*m.*	*s.*
Chronometer fast by 7 obs. of east star…………	7	09	08.04
Chronometer fast by 8 obs. of west star…………			10.84
Mean…………………………………	7	09	09.44

APPENDIX No. 5—Continued.

July 19, 1846.—*Camp* 20, *Jackson Grove.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	26	44.5	118	20	50	7	11	38.9
3	28	02.5	117	52	50	7	11	36.1
3	29	15.2	117	27	35	7	11	38.8
3	30	13.8	117	06	15	7	11	38.0
3	31	24.0	116	41	15	7	11	38.7
9	32	16.5	116	23	30	7	11	41.7
3	33	11.0	116	03	30	7	11	40.5
3	34	05.0	115	43	35	7	11	33.6 rej.
3	35	05.7	115	22	10	7	11	40.5
3	35	55.5	115	03	45	7	11	39.2
3	36	43.0	114	46	25	7	11	38.8
3	37	41.0	114	25	50	7	11	40.2

Thermometer 72°.

Time, p. m.			Double altitudes of *a* Lyræ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	13	28.8	117	37	30	7	11	38.2
3	14	37.0	118	13	10	7	11	39.6
3	15	26.0	118	22	10	7	11	36.3
3	16	30.8	118	37	40	7	11	37.5
3	17	45.0	119	15	40	7	11	39.0
3	18	44.9	119	38	55	7	11	38.4
3	19	54.5	120	06	00	7	11	37.7
3	21	00.0	120	30	20	7	11	38.1

Thermometer 72°.

	h.	*m.*	*s.*
Chronometer fast by 11 obs. of west star..........	7	11	39.22
Chronometer fast by 8 obs, of east star			38.35
Mean....................................	7	11	38.78

APPENDIX No. 5—Continued.

July 19, 1846.—*Camp* 20, *Jackson Grove.*

DETERMINATION OF LATITUDE.

Time, p. m.			[illegible]uble altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	43	52.0	73	26	30	37	41	53
3	45	01.3	73	27	10	37	41	52
3	46	12.5	73	27	55	37	41	35
3	47	05.5	73	29	00	37	41	51
3	48	06.3	73	29	40	37	41	56
3	49	00.0	73	30	00	37	41	46
3	50	04.0	73	30	30	37	41	41
3	50	43.8	73	31	00	37	41	45
3	52	01.0	73	31	35	37	41	39
3	53	05.0	73	32	00	37	41	33
3	54	00.0	73	32	40	37	41	33
3	56	12.8	73	33	40	37	41	23
3	56	52.5	73	34	20	37	41	30
3	57	31.7	73	35	00	37	41	38
3	58	16.8	73	35	40	37	41	44

Thermometer 72°.

Mean of 15 observations, 57° 41′ 41″.

APPENDIX No. 5—Continued.

July 19, 1846.—*Camp* 20, *Jackson Grove*.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *a* Herculis, near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	18	25.5	133	31	35	37	41	41
4	20	04.8	133	35	50	37	41	56
4	22	52.5	133	41	40	37	41	26
4	24	15.8	133	44	00	37	41	15
4	25	46.6	133	45	45	37	41	10
4	27	38.5	133	46	30	37	41	21
4	28	59.7	133	46	30	37	41	29
4	30	10.0	133	46	20	37	41	29
4	31	23.9	133	45	40	37	41	33
4	32	12.2	133	45	00	37	41	36
4	33	19.7	133	43	40	37	41	45
4	35	13.0	133	41	15	37	41	46
4	36	10.5	133	39	20	37	41	51
4	37	06.0	133	38	20	37	41	28
4	38	18.4	133	34	40	37	41	58

	Deg.	*min.*	*sec.*	
Latitude by 15 obs. of Polaris..........	37	41	41	
Latitude by 15 obs. of *a* Herculis			35	
Mean	37	41	38	lat. of camp.

APPENDIX No. 5—Continued.

July 19, 1846.—*Camp* 20, *Jackson Grove, Arkansas.*

DETERMINATION OF TIME.

Time.			Double altitude of the sun's upper limb.		Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*
10	34	23.6	89	30	7	11	38.2
10	34	50.2	89	20	7	11	39.3
10	35	15.8	89	10	7	11	39.4
10	35	42.0	89	00	7	11	40.1
10	36	07.0	88	50	7	11	39.7
10	36	32.3	88	40	7	11	39.5
10	36	57.0	88	30	7	11	39.7
10	37	23.8	88	20	7	11	40.1
10	37	48.0	88	10	7	11	38.7
10	38	14.2	88	00	7	11	39.4
10	38	39.7	87	50	7	11	39.5
10	39	04.8	87	40	7	11	39.2
10	39	30.3	87	30	7	11	39.3
10	39	54.7	87	20	7	11	38.3
10	40	21.8	87	10	7	11	39.8
10	40	47.8	87	00	7	11	40.5

Thermometer 88°.

Mean of 16 observations 7*h*. 11*m*. 39.36*s*.

DETERMINATION OF INDEX ERROR.

	Min.	*sec.*
On the arc	31	20
Off the arc................................	31	40

Index error = + 10″.

APPENDIX No. 5—Continued.

July 22, 1846.—Camp 23, Arkansas river.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of α Aquilæ.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	27	17.2	90	30	10	7	15	38.9
4	28	39.6	90	57	40	7	15	39.1
4	29	36.5	91	17	30	7	15	37.2
4	30	35.3	91	37	10	7	15	37.3
4	31	32.2	91	54	15	7	15	43.0
4	32	34.8	92	15	55	7	15	40.3
4	33	46.7	92	40	20	7	15	38.7

Thermometer 68°.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	37	33.7	88	34	30	7	15	39.3
4	38	20.0	88	16	20	7	15	39.1
4	39	17.5	87	54	20	7	15	40.3
4	40	43.8	87	20	40	7	15	40.5
4	41	30.7	87	01	50	7	15	39.1
4	42	19.1	86	43	10	7	15	39.8
4	43	30.8	86	15	50	7	15	41.7

Thermometer 68°.

	h.	*m.*	*s.*
Chronometer fast by 6 observations east star......	7	15	38.58
Chronometer fast by 7 observations west star			39.97
Mean......................	7	15	39.28

APPENDIX No. 5—Continued.

July 22, 1846.—Camp 23.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	49	32.5	74	47	10	37	57	20
4	50	37.0	74	48	10	37	57	33
4	51	26.8	74	48	50	37	57	34
4	52	01.8	74	49	20	37	57	37
4	52	46.0	74	49	55	37	57	40
4	53	37.3	74	50	44	37	57	42
4	54	34.9	74	51	20	37	57	41
4	55	16.8	74	52	00	37	57	45
4	56	34.0	74	52	45	37	57	39
4	57	16.0	74	53	15	37	57	40
4	57	57.5	74	54	00	37	57	47

Thermometer 68°.

Mean of 11 observations, 37° 57′ 39″.

APPENDIX No. 5—Continued.

July 25, 1846.—Camp 26, Arkansas river.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	37	02.7	74	10	30	38	01	01
3	38	16.5	74	11	10	38	00	58
3	39	16.5	74	11	50	38	00	56
3	39	51.5	74	12	30	38	01	07
3	40	35.0	74	13	10	38	01	14
3	42	17.2	74	13	50	38	01	04
3	43	08.2	74	14	50	38	01	18
3	44	20.8	74	15	15	38	01	07
3	45	08.5	74	15	40	38	01	05
3	45	52.0	74	16	20	38	01	11
3	46	27.5	74	16	55	38	01	17
3	47	14.8	74	17	10	38	01	10
3	47	55.2	74	17	30	38	01	07
3	48	06.1	74	17	55	38	01	08
3	50	27.8	74	19	30	38	01	18

Thermometer, 78°.

Mean of 15 observations, 38° 01′ 08″.

APPENDIX No. 5—Continued.

July 25, 1846.—*Camp* 26, *on the Arkansas.*

DETERMINATION OF TIME.

ue, p. m.		Double altitudes of Arcturus in the west.			Chronometer fast.			
n.	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
4	48.2	102	04	05	7	19	46.2	
6	33.8	101	24	50	7	19	48.5	
8	09.7	100	47	50	7	19	47.0	
9	13.7	100	23	25	7	19	46.9	
0	17.8	99	59	20	7	19	47.9	
1	28.6	99	31	40	7	19	46.4	
2	27.7	99	08	55	7	19	45.8	
3	30.0	98	45	40	7	19	47.4	
4	33.5	98	20	20	7	19	44.8	rej.

Thermometer, 77°.

ue, p. m.		Double altitudes of *a* Aquilæ in the east.			Chronometer fast.			
n.	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
1	05.8	87	32	30	7	19	46.9	
2	20.7	87	58	20	7	19	46.7	
3	14.5	88	16	20	7	19	48.0	
4	46.7	88	47	55	7	19	47.8	
5	43.0	89	06	20	7	19	50.0	
6	34.6	89	24	40	7	19	48.7	
7	32.5	89	44	50	7	19	46.2	
8	34.0	90	04	50	7	19	48.4	
9	47.8	90	30	10	7	19	47.0	
0	32.2	90	53	15	7	19	52.5	rej.

Thermometer, 77°.

	h.	*m.*	*s.*
eter fast by 8 obs. of west star..........	7	19	47.61
eter fast by 9 obs. of west star..........			47.78
....	7	19	47.40

APPENDIX No. 5—Continued.

July 29, 1846.—*Camp* 30, *near Bent's Fort.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	20	28.0	88	19	10	7	25	31.6
4	21	57.7	87	44	30	7	25	32.4
4	22	59.0	87	20	25	7	25	31.9
4	24	02.0	86	56	00	7	25	32.4
4	25	09.8	86	29	30	7	25	32.4
4	25	57.5	86	10	50	7	25	32.3
4	26	59.2	85	46	43	7	25	32.3
4	28	04.7	85	20	05	7	25	29.7
4	28	56.5	84	59	40	7	25	29.4
4	30	01.0	84	35	10	7	25	31.2
4	31	01.5	84	11	50	7	25	32.2

Time, p. m.			Double altitudes of *a* Aquilæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	34	06.8	98	20	30	7	25	32.3
4	35	39.8	98	48	50	7	25	33.6
4	36	50.1	99	10	20	7	25	33.8
4	37	48.6	99	28	30	7	25	33.9
4	39	17.0	99	55	30	7	25	33.2
4	40	44.0	100	21	20	7	25	35.0
4	41	58.0	100	44	20	7	25	32.6
4	43	28.8	101	12	10	7	25	30.0
4	44	24.5	101	26	55	7	25	35.9
4	45	35.0	101	48	40	7	25	32.6
4	46	57.7	102	13	20	7	25	31.4

Thermometer, 66°.

	h.	*m.*	*s.*
Chronometer fast by 11 observations of west star..	7	25	31.62
Chronometer fast by 12 observations of east star ..			32.12
Mean..	7	25	31.87

APPENDIX No. 5—Continued.

July 30, 1846.—*Camp* 30, *near Bent's Fort.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	33	05.8	104	59	30	7	25	32.1
3	34	37.0	104	24	50	7	25	30.1
3	35	32.5	104	04	05	7	25	31.6
3	37	00.8	103	30	55	7	25	31.9
3	38	00.0	103	08	30	7	25	31.8
3	39	08.5	102	42	30	7	25	31.4
3	40	06.2	102	20	50	7	25	31.9
3	41	00.0	102	00	20	7	25	31.6
3	42	12.5	101	32	30	7	25	29.7

Thermometer 74°.

Time, p. m.			Double altitudes of α Aquilæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	46	06.8	83	40	25	7	25	29.4
3	47	23.0	84	07	00	7	25	30.1
3	49	03.5	84	41	50	7	25	31.3
3	50	02.5	85	03	20	7	25	29.0
3	50	56.0	85	21	10	7	25	31.3
3	51	48.1	85	40	00	7	25	29.2
3	52	46.5	86	00	10	7	25	33.5
3	53	35.7	86	16	30	7	25	32.1
3	54	46.0	86	42	10	7	25	28.2

Thermometer 74°.

	h.	*m.*	*s.*
Chronometer fast by 9 obs. of west star	7	25	31.46
Chronometer fast by 9 obs. of east star...........			30.44
Mean	7	25	30.95

APPENDIX No. 5—Continued.

July 30, 1846.—*Camp* 30, *near Bent's Fort.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	01	31.0	74	38	55	38	02	47
4	03	07.8	74	39	55	38	03	03
4	04	23.0	74	41	15	38	03	06
4	05	17.1	74	41	50	38	02	54
4	06	17.0	74	42	30	38	02	52
4	07	15.2	74	43	00	38	02	46
4	08	08.0	74	43	50	38	02	52
4	09	04.5	74	44	20	38	02	50
4	10	12.2	74	45	20	38	02	55
4	11	18.5	74	45	50	38	02	45
4	12	20.0	74	46	55	38	03	06
4	13	26.0	74	47	40	38	02	54
4	14	11.2	74	48	30	38	03	04

Thermometer 74°.

Mean of 16 observations, 38° 02′ 55″.

APPENDIX No. 5—Continued.

July 30, 1846.—*Camp* 30, *near Bent's Fort.*

DETERMINATION OF TIME.

.	Double altitudes of sun's upper limb.		Time, p. m.			Chronometer fast.		
.	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
.3	90	00	10	40	02.5	7	25	30.06
.7	90	10	10	39	36.0	7	25	30.52
.0	90	20	10	39	10.0	7	25	30.18
.2	90	30	10	38	44.2	7	25	29.80
.3	90	40	10	38	17.5	7	25	30.10
.8	91	00	10	37	26.0	7	25	30.11
.2	91	10	10	37	00.0	7	25	29.42
.5	91	30	10	36	08.0	7	25	29.98
.0	92	40	10	33	06.0	7	25	31.76
.8	93	00	10	32	14.0	7	25	30.67
.8	93	10	10	31	47.7	7	25	31.03
.0	93	20	10	31	22.3	7	25	30.94
.0	83	30	10	30	57.4	7	25	31.50
7.0	93	40	10	30	29.5	7	25	31.06
2.8	93	50	10	30	04.2	7	25	31.32
3.8	94	00	10	29	37.5	7	25	30.99

Thermometer 78°.

Mean of 16 observations, 7*h.* 25*m.* 30.59*s.*

DETERMINATION OF INDEX ERROR.

	m.	*s.*
c	31	30
c..	31	30

Index error = 00″.

APPENDIX No. 5—Continued.

July 30, 1846.—*Camp* 30, *near Bent's Fort.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitude of *a* Aquilæ near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
6	24	18.8	120	40	40	38	02	37
6	25	30.0	120	42	30	38	02	44
6	26	47.5	120	46	10	38	02	14
6	27	58.0	120	47	10	38	02	37
6	29	05.5	120	48	50	38	02	33
6	30	07.6	120	50	10	38	02	28
6	31	16.5	120	50	50	38	02	36
6	32	37.0	120	51	50	38	02	31
6	33	37.0	120	52	10	38	02	32
6	35	02.8	120	52	30	38	02	27
6	36	26.0	120	53	00	38	02	04
6	37	48.8	120	52	25	38	02	01
6	38	57.1	120	51	00	38	02	21
6	39	56.5	120	49	50	38	02	28
6	41	04.6	120	48	55	38	02	15
6	42	06.5	120	47	10	38	02	25
6	44	38.0	120	42	50	38	02	22
6	47	08.8	120	37	20	38	02	16

Thermometer 68°.

Mean of 18 observations, 38° 32′ 25″.

APPENDIX No. 5—Continued.

July 31, 1846.—*Camp* 30, *near Bent's Fort.*

DETERMINATION OF LONGITUDE BY LUNAR DISTANCE.

Time, p. m.			*a* Aquilæ and moon's west limb.			Double altitude of moon's upper limb.			Longitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	12	39.6	75	42	10	64	09	50	6	50	05.1
3	16	04.0	75	41	30	63	34	10	6	48	45.1
3	18	55.8	75	40	30	63	01	30	6	48	57.5
3	21	04.0	75	39	30	62	41	40	6	49	55.9
3	26	06.8	75	37	40	61	48	20	6	50	29.8
3	28	11.8	75	37	00	61	23	50	6	50	29.8
3	30	23.3	75	36	25	60	56	40	6	50	02.1

Time, p. m.			Spica Virginis and moon's west limb.			Moon's lower limb.			Longitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	40	33.0	24	26	40	57	46	50	6	55	13.7
3	46	51.0	24	27	55	56	49	10	6	55	02.9
3	48	54.0	24	28	40	56	01	40	6	52	19.2
3	50	58.2	24	29	20	55	33	40	6	52	22.7

Thermometer, 78°.

	h.	*m.*	*s.*
Longitude by 7 observations of *a* Aquilæ.........	6	49	49.33
Longitude by 4 observations of Spica	6	53	44.12
Mean....................................	6	51	46.72

APPENDIX No. 5—Continued.

July 31, 1846.—*Camp* 30, *near Bent's Fort.*

DETERMINATION OF TIME.

Time, a. m.			Double altitudes of sun's upper limb.		Time, p. m.			Chronometer fa		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	
4	18	04.2	87	50	10	44	49.5	7	25	27
4	18	31.0	88	00	10	44	23.5	7	25	27
4	18	55.9	88	10	10	43	57.2	7	25	26
4	19	21.7	88	20	10	43	32.0	7	25	27
4	19	48.0	88	30	10	43	05.5	7	25	27
4	20	13.6	88	40	10	42	39.8	7	25	27
4	20	39.0	88	50	10	42	13.8	7	25	27
4	21	06.0	89	00	10	41	48.0	7	25	27
4	21	32.0	89	10	10	41	22.0	7	25	27
4	21	57.5	89	20	10	40	57.7	7	25	28
4	22	23.0	89	30	10	40	30.0	7	25	26

Thermometer, 77°.

Mean of 11 observations, 7*h.* 25*m.* 27.50*s.*

APPENDIX No. 5—Continued.

July 31, 1846.—*Camp* 30, *near Bent's Fort.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	05	05.8	91	12	50	7	25	28.0
4	05	52.3	90	54	05	7	25	26.3
4	06	40.5	90	35	55	7	25	28.0
4	07	36.4	90	14	20	7	25	28.1
4	08	32.7	89	52	50	7	25	29.0
4	09	27.7	89	31	00	7	25	27.9
4	10	22.8	89	09	30	7	25	27.8

Time, p. m.			Double altitudes of *a* Aquilæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h*	*m.*	*s.*
4	12	45.2	94	04	50	7	25	26.3
4	13	46.0	94	23	50	7	25	29.0
4	14	48.2	94	44	45	7	25	26.3
4	15	50.0	95	04	35	7	25	26.5
4	16	35.0	95	19	20	7	25	25.7
4	17	43.8	95	40	30	7	25	28.4
4	18	47.0	96	01	00	7	25	26.5

	h.	*m.*	*s.*
Chronometer fast by 7 obs. of west star...........	7	25	27.87
Chronometer fast by 7 obs. of east star...........			26.96
Mean..............................	7	25	27.41

APPENDIX No. 5—Continued.

July 31, 1846.—*Camp* 30, *near Bent's Fort.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	27	45.2	75	00	30	38	02	45
4	28	50.0	75	01	15	38	02	43
4	30	06.3	75	01	50	38	02	33
4	31	20.5	75	02	50	38	02	36
4	32	07.5	75	04	00	38	02	55
4	33	07.0	75	04	40	38	02	52
4	34	08.8	75	05	30	38	02	52
4	35	19.6	75	06	05	38	02	43
4	36	13.0	75	06	30	38	02	36
4	44	03.0	75	13	00	38	02	55
4	45	20.7	75	13	30	38	02	40
4	46	26.8	75	14	20	38	02	40
4	47	09.0	75	14	50	38	02	39
4	48	05.5	75	15	40	38	02	46
4	48	46.6	75	16	05	38	02	39
4	49	35.2	75	16	50	38	02	45

Thermometer 76°.

Mean of 16 observations, 38° 02′ 44″.

APPENDIX No. 5—Continued.

July 31, 1846.—Camp 30, near Bent's Fort.

DETERMINATION OF LATITUDE.

p. m.	Double altitudes of α Aquilæ, near the meridian.	Latitude.
s.	*Deg. min. sec.*	*Deg. min. sec.*
36.0	120 44 30	38 03 17
28.5	120 47 30	38 03 48
38.0	120 49 50	38 03 20
55.2	120 51 10	38 03 17
05.2	120 52 05	38 03 16
00.0	120 52 40	38 03 10
08.0	120 52 40	38 03 20
18.2	120 52 00	38 03 11
21.0	120 51 30	38 03 54
04.7	120 51 30	38 03 31
47.5	120 51 05	38 03 23
35.0	120 50 00	38 03 34
39.8	120 48 20	38 03 49
41.8	120 47 50	38 03 24
37.8	120 45 50	38 03 44
25.5	120 45 20	38 03 18
07.0	120 43 20	38 03 40

Thermometer 68°.

Mean of 17 observations, 38° 03′ 28″.

APPENDIX No. 5—Continued.

July 31, 1846.—*Camp* 30.

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of *α* Aquilæ from moon's west limb.			Longitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	12	39.6	75	42	10	6	50	05.1
3	16	04.0	75	41	30	6	48	45.1
3	18	55.8	75	40	30	6	48	57.5
3	21	04.0	75	39	30	6	49	55.9
3	26	06.8	75	37	40	6	50	29.8
3	28	11.8	75	37	00	6	50	29.8
3	30	23.3	75	36	25	6	50	02.1

Time, p. m.			Distance of *a* Virginis from moon's west limb.			Longitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	40	33.0	24	26	40	6	55	13.7
3	46	51.0	24	27	55	6	55	02.9
3	48	54.0	24	28	40	6	52	17.2
3	50	58.2	24	29	20	6	52	22.7

APPENDIX No. 5—Continued.

August 1, 1846.—*Camp* 30.

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of *a* Virginis from moon's west limb.			Longitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	24	02.0	37	40	05	6	53	22.0
3	27	34.5	37	41	30	6	53	30.1
3	29	27.8	37	42	05	6	53	11.0
3	31	30.0	37	43	00	6	53	38.3
3	33	31.5	37	43	40	6	53	24.2
3	35	48.0	37	44	25	6	53	11.0

Time, p. m.			Distance of *a* Aquilæ from moon's west limb.			Longitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	39	46.5	63	37	15	6	50	24.7
3	41	50.2	63	36	30	6	50	36.8
3	43	39.7	63	35	50	6	50	48.8
3	45	43.5	63	34	55	6	51	31.0
3	48	29.2	63	33	50	6	52	04.1
3	49	58.5	63	33	20	6	52	04.1
3	51	24.6	63	32	50	6	52	07.2

	h.	*m.*	*s.*
Longitude by 14 observations of *a* Aquilæ	6	50	35.86
Longitude by 10 observations of *a* Virginis	6	53	31.36
Mean....................................	6	52	03.61

APPENDIX No. 5—Continued.

August 1, 1846.—*Camp* 30, *near Bent's Fort.*

DETERMINATION OF TIME.

Time, a. m.			Double altitudes of sun's upper limb.		Time, p. m.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
5	41	17.5	118	00	9	21	28.0	7	25	28.42
5	41	47.8	118	10	9	20	57.7	7	25	28 33
5	42	18.0	118	20	9	20	27.0	7	25	28.10
5	42	47.2	118	30	9	19	57.0	7	25	27.71
5	43	17.6	118	40	9	19	26.7	7	25	27.78
5	43	48.0	118	50	9	18	55.8	7	25	27.54
5	44	19.0	119	00	9	18	25.8	7	25	28.05
5	44	48.8	119	10	9	17	55.7	7	25	27.92
5	45	18.6	119	20	9	17	25.3	7	25	27.64
5	46	20.2	119	40	9	16	24.2	7	25	27.81
5	46	50.8	119	50	9	15	55.8	7	25	28.02
5	47	21.0	120	00	9	15	23.2	7	25	27.84

APPENDIX No. 5—Continued.

August 3, 1846.—*Camp* 32.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	42	40.2	96	04	00	7	27	03.3
3	45	35.7	94	55	50	7	27	03.0
3	47	24.0	94	14	05	7	27	03.7
3	48	17.8	93	52	30	7	27	01.9
3	49	02.7	93	35	30	7	27	03.0
3	49	52.5	93	16	10	7	27	03.1
3	50	31.6	93	01	00	7	27	03.1
3	51	18.8	92	41	50	7	27	01.2

Thermometer 76°.

Time, p. m.			Double altitudes of *a* Aquilæ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	54	06.0	91	36	40	7	27	02.3
3	54	46.8	91	49	50	7	27	04.0
3	55	38 5	92	07	30	7	27	02.9
3	56	40.0	92	27	25	7	27	04.9
3	57	36.1	92	46	00	7	27	05.1
3	58	25.2	93	02	40	7	27	04.1
3	59	13.1	93	17	40	7	27	06.9

Thermometer 76°.

	h.	*m.*	*s.*
Chronometer fast by 8 obs. of west star...........	7	27	02.79
Chronometer fast by 7 obs. of east star............			04.31
Mean..................................	7	27	03.55

APPENDIX No. 5—Continued.

August 3, 1846—*Camp* 32.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	03	41.0	74	15	05	37	44	59
4	04	36.6	74	15	55	37	45	06
4	05	28.5	74	16	30	37	45	01
4	06	35.0	74	16	55	37	44	55
4	07	11.8	74	17	40	31	45	01
4	08	09.7	74	18	05	37	44	54
4	09	03.5	74	18	35	37	44	50
4	09	46.3	74	18	55	37	44	45
4	10	39.0	74	19	55	37	44	55

Thermometer 75°.

Mean of 9 observations, 37° 44′ 56″.

APPENDIX No. 5—Continued.

August 5, 1846.—*Camp* 34, *on the Purgatory.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	06	29.5	73	15	05	37	12	06
4	07	52.0	73	15	50	37	11	59
4	08	51.2	73	16	40	37	12	03
4	09	53.3	73	17	10	37	11	55
4	12	43.0	73	19	30	37	12	02
4	13	40.8	73	20	05	37	11	59
4	15	15.5	73	20	55	37	11	49
4	15	53.4	73	21	40	37	11	58
4	19	55.0	73	24	20	37	11	46
4	20	38.8	73	25	30	37	12	06
4	21	14.6	73	25	50	37	12	04
4	21	50.0	73	26	10	37	12	00
4	22	34.6	73	26	40	37	11	54

Thermometer 67°.

Wind very high; observations imperfect.

Mean of 13 observations, 37° 11′ 59″.

APPENDIX No. 5—Continued.

August 5, 1846.—*Camp* 34, *on the Purgatory.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Aquilæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	28	01.5	104	44	20	7	29	24.7
4	29	21.3	105	06	55	7	29	26.9
4	30	16.6	105	22	50	7	29	27.2
4	31	24.0	105	41	50	7	29	28.6
4	32	12.7	105	55	50	7	29	28.4
4	33	14.5	106	13	30	7	29	28.2
4	34	28.0	106	35	00	7	29	25.6

Thermometer 67°.

Mean of 7 observations, 7*h.* 29*m.* 27.09*s.*

APPENDIX No. 5—Continued.

August 6, 1846.—*Camp* 35, *in the Raton.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	46	15.5	72	40	50	37	00	36
3	47	57.8	72	41	40	37	00	25
3	49	20.7	72	42	40	37	00	26
3	50	48.8	72	43	40	37	00	22
3	51	52.7	72	44	20	37	00	20
3	53	05.5	72	45	20	37	00	24
3	54	07.5	72	45	50	37	00	15
3	55	28.0	72	46	30	37	00	06
3	56	21.6	72	47	30	37	00	17

Thermometer 64°.

Mean of 9 observations, 37° 00′ 21″

APPENDIX No. 5—Continued.

August 6, 1846.—*Camp* 35, *in the Raton.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m*	*s.*	*Deg*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	00	00.8	85	48	55	7	29	28.4
4	01	09.0	85	22	15	7	29	29.6
4	02	09.0	84	58	20	7	29	29.4
4	03	06.6	84	35	45	7	29	30.2
4	04	19.7	84	08	05	7	29	33.8 rej.
4	05	12.5	83	45	50	7	29	30.7
4	06	18.8	83	19	55	7	29	31.9

Thermometer 64°.

Time, p m.			Double altitudes of *a* Aquilæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	11	33.4	101	09	55	7	29	31.9
4	13	42.8	101	50	00	7	29	32.3
4	14	54.7	102	11	50	7	29	33.5
4	15	50.5	102	28	40	7	29	34.4
4	16	43.6	102	45	10	7	29	33.5
4	17	42.5	103	03	10	7	29	33.2
4	18	52.0	103	24	10	7	29	33.4

Thermometer 63°.

	h.	*m.*	*s.*
Chronometer fast by 6 observations of west star..	7	29	30.03
Chronometer fast by 7 observations of east star ..			33.17
Mean	7	29	31.60

APPENDIX No. 5—Continued.

846.—*Camp 36, on the Canadian, south side, about one mile and a half below the crossing.*

DETERMINATION OF TIME.

. m.	Double altitudes of Arcturus in the west.	Chronometer fast.
s.	*Deg. min. s c.*	*h. m. s.*
22.7	94 01 50	7 29 20.2
14.5	93 41 30	7 29 20.6
01.0	93 22 30	7 29 19.1
45.3	93 04 55	7 29 18.9
39.0	92 44 20	7 29 20.5
34.6	92 21 40	7 29 18.9
13.0	92 04 50	7 29 14.8 rej.
02.0	91 47 35	7 29 20.1

Thermometer, 59°.

p. m.	Double altitudes of *a* Aquilæ in the east.	Chronometer fast.
s.	*Deg. min. sec.*	*h. m. s.*
56.5	93 43 00,	7 29 22.7
13.3	94 09 30	7 29 21.6
15.8	94 30 20	7 29 22.6
01.0	94 46 00	7 29 21.0
53.8	95 03 05	7 29 24.5
43.0	95 19 50	7 29 22.8
36.2	95 37 40	7 29 23.2
34.0	95 57 15	7 29 22.5

Thermometer, 59°.

	h.	*m.*	*s.*
er fast by 7 observations of west star...	7	29	19.76
er fast by 8 observations of east star ...			22.61
....	7	29	21.18

APPENDIX No. 5—Continued.

August 7, 1836.—*Camp* 36.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	55	48.0	72	23	45	36	47	11
3	56	59.3	72	24	55	36	47	25
3	57	59.3	72	25	40	36	47	25
3	59	09.0	72	27	00	36	47	37
4	00	32.6	72	28	10	36	47	52
4	01	39.0	72	28	50	36	47	38
4	02	25.3	72	29	55	36	47	54
4	03	31.0	72	30	25	36	47	44
4	04	15.0	72	31	00	36	47	45
4	05	24.2	72	31	10	36	47	25
4	06	15.5	72	31	40	36	47	21

Thermometer, 59°.

Mean of 11 observations, 36° 47′ 34″.

Variation of the needle, determined by the eastern elongation of Polaris, = 12° east.

APPENDIX No. 5—Continued.

August 8, 1846.—*Camp* 36.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Aquilæ in the east.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
4	01	14.8	100	44	25	7	29	16.8	
4	02	07.6	100	59	55	7	29	20.4	
4	03	02.2	101	17	20	7	29	19.8	
4	03	53.7	101	33	30	7	29	19.7	
4	05	12.8	101	57	45	7	29	21.4	
4	06	08.8	102	15	50	7	29	19.1	
4	07	03.7	102	33	25	7	29	17.2	
4	08	03.5	102	52	30	7	29	15.1	rej.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	10	06.0	78	37	10	7	29	17.7
4	11	00.8	78	15	30	7	29	18.7
4	11	57.7	77	52	30	7	29	18.9
4	12	48.0	77	32	05	7	29	17.3
4	13	59.8	77	03	25	7	29	17.4
4	14	53.7	76	41	30	7	29	16.6
4	15	38.0	76	24	20	7	29	18.1
4	16	42.5	75	57	35	7	29	15.9
4	17	32.5	75	38	30	7	29	18.2
4	18	12.8	75	21	30	7	29	16.1

Thermometer 63°.

	h.	m.	s.
Chronometer fast by 7 obs. of east star...........	7	29	19.29
" 10 " west star			17.49
Mean....................................	7	29	18.34

DETERMINATION OF INDEX ERROR.

	Min.	*sec.*	*Min.*	*sec.*
On the arc.................	31	40	31	35
Off the arc.................	31	45	31	45

Index error = + 3.7.

APPENDIX No. 5—Continued.

August 10, 1846.—*Camp* 38, *on the Cimmaron Citon.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	10	58.7	99	36	40	7	30	32.9
3	11	49.0	99	17	25	7	30	34.3
3	12	40.2	98	56	45	7	30	33.1
3	13	43.5	98	31	40	7	30	32.7
3	14	31.0	98	13	00	7	30	32.9
3	15	17.0	97	54	45	7	30	32.6
3	16	10.0	97	34	10	7	30	33.5

Thermometer 59°.

Time, p. m.			Double altitudes of α Aquilæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	18	54.0	89	01	35	7	30	33.1
3	20	08.2	89	27	40	7	30	34.1
3	21	17.1	89	52	25	7	30	33.1
3	22	34.1	90	18	45	7	30	35.6
3	23	43.8	90	43	20	7	30	35.6
3	24	43.5	91	03	55	7	30	36.5
3	25	27.0	91	20	00	7	30	34.4

Thermometer 59°.

	h.	*m.*	*s.*
Chronometer fast by 7 obs. of east star...........	7	30	34.63
Chronometer fast by 7 obs of west star..........			33.14
Mean....................................	7	30	33.88

APPENDIX No. 5—Continued.

August 10, 1846.—*Camp* 38.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	29	03.5	71	33	25	36	27	43
3	29	58.0	71	34	00	36	27	44
3	31	09.0	71	35	10	36	27	52
3	32	20.0	71	35	50	36	27	47
3	33	25.0	71	36	50	36	27	54
3	34	36.5	71	37	30	36	27	50
3	35	27.2	71	38	20	36	27	59
3	36	14.5	71	38	50	36	27	55
3	37	03.8	71	39	10	36	27	47
3	37	45.4	71	39	55	36	27	52
3	38	44.0	71	40	30	36	27	51

Thermometer 58°.

Mean of 11 observations, 36° 27′ 50″

APPENDIX No. 5—Continued.

August 12, 1846.—*Camp* 40.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
9	16	50 0	71	35	30	7	31	26.9
9	17	38.5	71	18	15	7	31	28.3
9	18	44.6	70	53	50	7	31	27.7
9	19	43.0	70	31	50	7	31	26.0
9	20	24.2	70	16	10	7	31	24.4
9	21	11.8	69	59	20	7	31	25.9
9	22	03.6	69	40	15	7	31	25.5

Time, a. m.—August 13.			Double altitudes of sun's upper limb.		Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*
4	05	34.3	77	50	7	31	25.0
4	06	00.5	78	00	7	31	26.1
4	06	26.2	78	10	7	31	26.7
4	06	51.7	78	20	7	31	27.1
4	07	16.2	78	30	7	31	26.5
4	07	41.0	78	40	7	31	26.2
4	08	05.0	78	50	7	31	25.1
4	08	29.2	79	00	7	31	24.1
4	08	54.2	79	10	7	31	24.0
4	09	20.0	79	20	7	31	24.6
4	09	44.6	79	30	7	31	24.1

Thermometer 66°.

	h.	*m.*	*s.*
Chronometer fast by 11 observations of sun in east	7	31	25.49
Rate for 7 hours..................................			88
Chronometer fast at 13*h*., August 12..............	7	31	26.37
Chronometer fast by *a* Lyræ, in the west..........			26.39
Mean	7	31	26.38

APPENDIX No. 5—Continued.

August 12, 1846.—*Camp* 40.

DETERMINATION OF LATITUDE.

, p. m.	Double altitudes of Polaris.	Latitude.
s.	*Deg. min. sec.*	*Deg. min. sec.*
11.2	74 33 30	35 54 06
38.0	74 34 25	35 54 19
09.0	74 35 00	35 54 20
14.7	74 35 30	35 54 24
18.5	74 36 00	35 54 29
18.5	74 36 00	35 54 18
27.0	74 36 50	35 54 31
25.8	74 37 00	35 54 26
38.5	74 37 15	35 54 22
38.5	74 37 30	35 54 19

Thermometer 49°.

Mean of 10 observations, 35° 54′ 21″.

APPENDIX No. 5—Continued.

August 14, 1846.—*Camp* 42, *about one mile south of the Vegas.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	42	51.8	81	21	30	7	32	05.0
3	44	19.8	80	45	45	7	32	05.1
3	45	35.9	80	16	15	7	32	08.9
3	46	38.2	79	50	50	7	32	08.7
3	47	42.7	79	24	20	7	32	08.1
3	48	58.6	78	53	10	7	32	07.4
3	49	55.0	78	30	30	7	32	08.1

Thermometer 60°.

Time, p m.			Double altitudes of *a* Aquilæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	52	21.4	105	59	30	7	32	06.3
3	53	39.0	106	23	45	7	32	05.5
3	54	51.7	106	47	25	7	32	01.5
3	56	02.5	107	08	20	7	32	03.8
3	57	12.0	107	29	35	7	32	03.1
3	58	18.8	107	49	50	7	32	02.9
3	59	19.0	108	07	30	7	32	04.4

Thermometer 60°.

	h.	*m.*	*s.*
Chronometer fast by 7 obs. of east star............	7	32	03.93
Chronometer fast by 7 obs. of west star..........			07.36
Mean..	7	32	05.64

APPENDIX No. 5—Continued.

August 14, 1846.—*Camp* 42, *one mile south of the Vegas.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	03	54.2	70	23	25	35	34	50
4	05	06.0	70	24	10	35	34	46
4	05	51.0	70	25	30	35	35	08
4	06	52.5	70	25	50	35	34	55
4	08	09.0	70	26	50	35	34	56
4	09	09.0	70	28	10	35	35	13
4	10	11.5	70	29	10	35	35	21
4	11	12.0	70	29	50	35	35	15
4	11	59.0	70	30	35	35	35	20

Thermometer 60°.

Mean of 9 observations, 35° 35′ 05″.

APPENDIX No. 5—Continued.

August 15, 1846.—*Camp* 43, *Vernal Spring.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	25	03.0	87	14	30	7	32	35.7
3	25	59.0	86	51	40	7	32	35.5
3	26	57.1	86	28	30	7	32	36.7
3	27	45.2	86	08	50	7	32	36.5
3	28	26.7	85	51	30	7	32	35.4
3	29	09.8	85	33	55	7	32	35.3
3	29	57.3	85	15	10	7	32	36.7

Thermometer 68°.

Time, p. m.			Double altitudes of *a* Aquilæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	33	34.8	101	18	30	7	32	30.9
3	34	31.1	101	38	25	7	32	30.3
3	35	34.1	101	58	30	7	32	32.3
3	36	23.0	102	14	30	7	32	32.8
3	37	10.5	102	30	05	7	32	32.8
3	38	15.0	102	51	40	7	32	31.2
3	39	17.0	103	11	15	7	32	33.2

Thermometer 65°.

	h.	*m.*	*s.*
Chronometer fast by 7 observations of east star	7	32	31.93
" " 7 " west star			35.97
Mean........................	7	32	33.95

APPENDIX No. 5—Continued.

August 15, 1846.—*Camp* 43.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	48	13.5	69	50	40	35	23	05
3	49	19.5	69	51	30	35	23	06
3	50	03.2	69	52	15	35	23	12
3	51	08.5	69	53	30	35	23	25
3	51	59.2	69	54	25	35	23	32
3	53	06.0	69	54	55	35	23	23
3	53	59.0	69	55	25	35	23	10
3	54	54.0	69	56	20	35	23	03
3	55	49.5	69	57	00	35	23	24

Thermometer 65°.

Mean of 9 observations, 35° 23′ 19″.

APPENDIX No. 5—Continued.

August 19, 1846.—*Santa Fe.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Coronæ Borealis in the west.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
4	32	23.0	93	16	00	7	34	49.3	rej.
4	33	37.7	92	47	05	7	34	52.8	
4	34	35.0	92	23	40	7	34	52.4	
4	35	26.8	92	02	00	7	34	50.9	
4	36	20.0	91	41	05	7	34	52.5	
4	37	12.9	91	18	50	7	34	50.7	
4	38	31.7	90	48	20	7	34	54.4	rej.
4	39	26.0	90	24	35	7	34	50.1	
4	40	23.0	90	01	40	7	34	50.6	

Thermometer 60°.

Time, p. m.			Double altitudes of *a* Pegasi in the east.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
5	10	46.0	77	41	25	7	34	62.7	rej
5	11	51.2	78	10	00	7	34	55.5	
5	12	39.6	78	28	25	7	34	57.9	
5	13	38.8	78	51	20	7	34	59.5	rej
5	14	22.0	79	10	00	7	34	56.0	
5	15	19.0	79	33	20	7	34	54.4	
5	16	23.8	79	57	20	7	34	54.5	
5	17	31.2	80	23	20	7	34	61.2	rej
5	18	32.5	80	49	30	7	34	56.8	

Thermometer 59°.

	h.	*m.*	*s.*
Chronometer fast by 6 observations of east star....	7	34	55.
Chronometer fast by 7 observations of west star....			51.
Mean..................................	7	34	53.

APPENDIX No. 5—Continued.

August 19, 1846.—*Santa Fe.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	24	20.0	71	51	10	35	40	47 rej.
5	25	34.0	71	52	40	35	41	03
5	26	51.0	71	53	50	35	41	09
5	27	52.5	71	54	41	35	41	11
5	28	47.0	71	55	40	35	41	18
5	30	07.5	71	56	30	35	41	12
5	30	55.2	71	57	10	35	41	13
5	31	28.0	71	57	55	35	41	23

Thermometer 59°.

Mean of 15 observations, 35° 41′ 13″.

APPENDIX No. 5—Continued.

August 20, 1846.—*Santa Fe.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Coronæ Borealis.			Chronometer fast.
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	
3	40	19.0	93	25	45	
3	41	49.5	92	47	10	
3	43	04.7	92	17	50	

Time. p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	
3	44	54.5	72	01	20	
3	45	46.2	71	40	30	
3	46	46.2	71	17	00	
3	47	36.2	70	56	10	
3	48	28.0	70	35	40	
3	49	26.9	70	11	00	
3	50	18.0	69	50	25	
3	51	09.8	69	29	50	
3	52	01.0	69	08	50	

Thermometer 62°.

APPENDIX No. 5—Continued.

August 20, 1846.—*Santa Fe.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	57	08.4	70	46	30	35	41	17
3	58	20.2	70	47	20	35	41	14
3	59	14.0	70	47	50	35	41	11
3	59	50.0	70	48	30	35	41	14
4	50	47.8	70	49	30	35	41	21
4	01	18.5	70	49	50	35	41	19
4	01	57.5	70	50	10	35	41	15
4	02	56.0	70	51	05	35	41	27
4	03	12.0	70	51	10	35	41	25

Thermometer 62°.

Mean of 15 observations, 35° 41′ 13″.

APPENDIX No. 5—Continued.

August 21, 1846.—*Santa Fe.*

Time, a. m.			Double altitudes of sun's upper limb.	
h.	*m.*	*s.*	*Deg.*	*min.*
5	08	35.5	99	50
5	10	04.0	99	00
5	10	58.0	99	20
5	11	25.5	99	30
5	11	53.8	99	40
5	12	21.5	99	50
5	12	47.8	100	00
5	13	44.0	100	20
5	14	12.5	100	30
5	14	39.2	100	40

Thermometer 68°.

APPENDIX No. 5—Continued.

August 22, 1846.—*Santa Fe.*

DETERMINATION OF TIME.

Time, a. m.—August 23.			Double altitudes of sun's upper limb.		Time, p. m.—Aug. 22.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
4	57	26.0	93	40	10	18	08.2	7	34	46.44
4	56	58.0	93	30	10	18	36.8	7	34	46.82
4	56	31.3	93	20	10	19	02.8	7	34	46.55
4	56	05.0	93	10	10	19	28.7	7	34	46.42
4	55	38.5	93	00	10	19	55.6	7	34	46.70
4	55	11.2	92	50	10	20	22.5	7	34	46.50
4	54	44.5	92	40	10	20	50.0	7	34	47.03
4	54	17.5	92	30	10	21	15.0	7	34	46.10

Thermometer 64°.

Mean of 8 observations; 7*h*. 34*m*. 46.58*s*.

APPENDIX No. 5—Continued.

August 22, 1846.—Santa Fe.

DETERMINATION OF TIME.

Time, a. m.			Double altitudes of sun's upper limb.	
h.	*m.*	*s.*	*Deg.*	*min.*
5	19	22.8	102	00
5	19	51.0	102	10
5	20	19.8	102	20
5	20	43.8	102	30
5	21	10.0	102	40
5	21	43.5	102	50
5	22	13.0	103	00
5	22	40.5	103	10
5	23	08.5	103	20
5	23	36.0	103	30
5	24	05.4	103	40
5	24	34.0	103	50
5	25	03.0	104	00

Thermometer 60°.

APPENDIX No. 5—Continued.

August 22, 1846.—*Santa Fe.*

Time, p. m.			Double altitudes of Coronæ Borealis.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
4	29	08.0	89	46	50
4	30	17.0	89	19	20
4	31	14.0	88	55	10
4	31	55.3	88	59	00
4	32	48.1	88	18	20
4	33	56.7	87	50	00
4	34	58.1	87	25	00
4	35	43.2	87	06	50
4	36	32.8	86	46	20

Thermometer 64°.

Time, p. m.			Double altitudes of *a* Pegasi.		
h	*m.*	*s.*	*Deg.*	*min.*	*sec.*
5	43	19.5	95	12	35
5	44	20.5	95	35	40
5	45	24.9	96	01	05
5	46	02.0	96	14	15
5	46	48.0	96	32	30
5	47	30.0	96	48	50
5	48	18.0	97	07	00
5	49	06.8	97	26	00
5	49	57.5	97	45	25

Thermometer 64°.

APPENDIX No. 5—Continued.

August 22, 1846.—Santa Fe.

Time, p. m.			Double altitudes of *a* Aquilæ near the meridian.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
5	00	33.0	125	16	05
5	01	29.5	125	18	05
5	02	32.0	125	21	00
5	03	39.3	125	23	55
5	04	54.0	125	27	20
5	06	20.8	125	30	15
5	07	18.0	125	31	30
5	08	21.5	125	33	10
5	09	17.5	125	33	50
5	10	04.8	125	34	20
5	11	10.6	125	35	40
5	14	10.0	125	38	40
5	16	12.0	125	37	40
5	17	28.4	125	36	55
5	18	15.5	125	35	00
5	21	14.2	125	32	20
5	22	39.5	125	29	00
5	23	50.0	125	23	40
5	25	16.5	125	21	05
5	26	37.0	125	17	00

Thermometer 64°.

APPENDIX No. 5—Continued.

August 23, 1846.—*Santa Fe.*

DETERMINATION OF TIME.

Double altitudes of sun's upper limb.		Time, p. m.			Chronometer fast.		
Deg.	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
92	30	10	19	46.5	7	34	44.54
92	40	10	19	19.8	7	34	44.69
92	50	10	18	54.0	7	34	45.13
93	00	10	18	26.6	7	34	45.07
93	10	10	17	50.5	7	34	45.26
93	20	10	17	34.0	7	34	45.15
93	30	10	17	05.8	7	34	44.39
93	40	10	16	39.4	7	34	45.10
93	50	10	16	13.5	7	34	45.22
94	00	10	15	47.1	7	34	46.02
94	10	10	15	19.7	7	34	45.21
94	20	10	14	52.5	7	34	45.45
94	30	10	14	24.0	7	34	44.35

Thermometer 69°.

Mean of 13 observations, 7*h.* 34*m.* 45.05*s.*

APPENDIX No. 5—Continued.

August 23, 1846.—*Santa Fe.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *a* Aquilæ near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	59	37.0	125	24	40	35	40	22
5	00	47.0	125	26	00	35	41	00 rej.
5	01	38.8	125	28	55	35	40	23
5	02	57.8	125	30	40	35	40	39
5	03	50.7	125	32	00	35	40	38
5	04	51.5	125	33	20	35	40	37
5	06	17.0	125	34	30	35	40	44
5	07	22.5	125	35	25	35	40	39
5	09	24.5	125	36	00	35	40	41
5	10	42.0	125	36	10	35	40	34
5	11	41.0	125	36	10	35	40	25
5	12	31.5	125	36	00	35	40	17
5	13	47.5	125	34	50	35	40	22
5	15	35.6	125	33	00	35	40	17
5	16	42.3	125	30	10	35	40	54 rej.
5	17	58.5	125	27	50	35	40	58 rej.
5	19	12.5	125	26	05	35	40	36
5	20	10.0	125	23	40	35	40	43

Thermometer 69°.

Mean of 15 observations, 35° 40′ 32″.

APPENDIX No. 5—Continued.

August 24, 1846.—*Santa Fe.*

Time, a. m.			Double altitudes of sun's upper limb.	
h.	*m.*	*s.*	*Deg.*	*min.*
4	55	39.0	92	40
4	56	04.0	92	50
4	56	32.2	93	00
4	56	59.0	93	10
4	57	25.8	93	20
4	57	53.8	93	30
4	58	19.7	93	40
4	58	47.0	93	50
4	59	14.5	94	00
4	59	42.1	94	10
5	00	08.5	94	20

Thermometer 68°.

APPENDIX No. 5—Continued.

August 28, 1846.—*Santa Fe.*

Time, p. m.			Double altitudes of sun's upper limb.		Time, a. m.—August 29.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*
10	45	22.0	80	00	4	26	24.5
10	45	48.1	79	50	4	25	58.5
10	46	14.5	79	40	4	25	32.5
10	46	40.0	79	30	4	25	05.5
10	47	07.5	79	20	4	24	39.2
10	47	32.0	79	10	4	24	14.5
10	47	58.2	79	00	4	23	47.5
10	48	21.8	78	50	4	23	21.2
10	48	51.8	78	40	4	22	55.5
10	49	16.4	78	30	4	22	29.0
10	49	42.7	78	20	4	22	03.4
10	50	08.6	78	10	4	21	35.3
10	50	34.6	78	00	4	21	12.2
10	51	00.0	77	50	4	20	44.5
10	51	26.2	77	40	4	20	18.8
10	51	52.5	77	30	4	19	53.0
Thermometer 70°.					Thermometer 66°.		

APPENDIX No. 5—Continued.

August 29, 1846.—*Santa Fe.*

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of *a* Aquilæ from moon's western limb.			Double altitudes of moon's lower limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	05	55.0	55	49	50	60	38	10
3	07	05.0	55	49	00	60	25	10
3	09	59.0	55	48	00	59	53	50
3	12	03.8	55	46	55	59	33	30
3	15	12.0	55	45	45	58	55	30
3	17	00.0	55	45	20	58	35	20
3	19	05.6	55	44	20	58	11	20
3	21	19.0	55	43	40	57	45	40

Thermometer 69°.

APPENDIX No. 5—Continued.

August 29, 1846.—*Santa Fe.*

DETERMINATION OF TIME.

Time, a. m.			Double altitudes of sun's upper limb.		Time, p. m.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
4	26	24.5	80	00	10	43	51.5	7	34	31.65
4	25	58.5	79	50	10	44	18.8	7	34	32.31
4	25	32.5	79	40	10	44	44.6	7	34	32.22
4	25	05.5	79	30	10	45	10.6	7	34	31.73
4	24	39.2	79	20	10	45	38.0	7	34	32.29
4	24	14.5	79	10	10	46	03.8	7	34	32.84
4	23	47.5	79	00	10	46	30.0	7	34	32.45
4	23	21.2	78	50	10	46	55.8	7	34	32.21
4	22	55.5	78	40	10	47	21.5	7	34	32.22
4	22	29.0	78	30	10	47	47.0	7	34	31.73
4	22	03.4	78	20	10	48	13.5	7	34	32.18
4	21	35.3	78	10	10	48	40.0	7	34	31.39
4	21	12.2	78	00	10	49	05.8	7	34	32.75
4	20	44.5	77	50	10	49	31.8	7	34	31.91
4	20	18.8	77	40	10	49	57.8	7	34	31.67
4	19	53.0	77	30	10	50	24.2	7	34	32.38
Thermom. 66°.					Thermom. 72°.					

Mean of 16 observations, 7*h*. 54*m*. 32.12*s*.

APPENDIX No. 5—Continued.

August 29, 1846.—*Santa Fe.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	22	59.8	72	22	05	35	41	35
5	23	50.5	72	22	20	35	41	20
5	24	54.0	72	23	10	35	41	23
5	25	30.0	72	24	00	35	41	34
5	26	21.5	72	24	30	35	41	30
5	27	04.8	72	25	30	35	41	44
5	27	58.5	72	26	00	35	41	39
5	28	57.0	72	26	40	35	41	37
5	29	42.5	72	27	05	35	41	33

Thermometer 68°.

Mean of 9 observations, 35° 41′ 33″.

APPENDIX No. 5—Continued.

August 29, 1846.—Santa Fe.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquarii, near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
6	23	30.0	96	10	15	35	40	56
6	24	16.8	96	10	25	35	41	09
6	25	13.8	96	10	30	35	41	11
6	26	46.8	96	10	30	35	41	11
6	27	32.0	96	11	15	35	40	44
6	28	22.8	96	11	00	35	40	43
6	29	04.7	96	10	20	35	40	54
6	29	34.2	96	09	55	35	40	58
6	30	15.5	96	09	25	35	41	01
6	30	59.0	96	08	30	35	41	12
6	31	33.5	96	08	00	35	41	12

Thermometer 66°.

Mean of 11 observations, 35° 41′ 01″.

APPENDIX No. 5—Continued.

August 29, 1846.—*Santa Fe.*

DETERMINATION OF LATITUDE.

p. m.	Double altitudes of *a* Aquarii near the meridian.	Latitude.
s.	*Deg. min. sec.*	*Deg. min. sec.*
57.5	106 26 30	35 40 49
23.0	106 28 10	35 40 56
36.8	106 29 40	35 40 52
44.0	106 30 55	35 40 45
42.0	106 32 30	35 40 35
56.1	106 32 10	35 40 57
45.8	106 32 00	35 41 01
19.2	106 31 30	35 40 57
11.0	106 30 50	35 41 01
00.0	109 29 55	35 41 09
10.8	106 28 30	35 41 18
20.0	106 27 30	35 41 08
38.4	106 26 30	35 40 45
22.8	106 21 45	35 41 05

Thermometer 66°.

Mean of 14 observations, 35° 40′ 57″.

APPENDIX No. 5—Continued.

August 29, 1846.—*Santa Fe.*

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of *a* Aquilæ from moon's west limb.			Longitude.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
3	05	55.0	55	49	50	7	05	52.5	rej.
3	07	05.0	55	49	00	7	04	25.1	
3	09	59.0	55	48	00	7	04	41.8	
3	12	03.8	55	46	55	7	03	48.4	
3	15	12.0	55	45	45	7	03	51.1	
3	17	00.0	55	45	20	7	04	33.8	
3	19	05.6	55	44	20	7	03	59.1	
3	21	19.0	55	43	40	7	04	25.8	

August 30, 1846.—*Santa Fe.*

Time, p. m.			Distance of Antares from moon's west limb.			Longitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	42	09.0	16	15	55	7	04	39.7
3	43	39.8	16	16	40	7	04	02.2
3	48	23.8	16	18	20	7	03	59.3
3	50	33.5	16	18	50	7	04	42.6
3	51	48.0	16	19	20	7	04	28.2
3	52	49.1	16	19	40	7	04	36.8
3	55	59.5	16	20	30	7	04	22.4
3	56	57.5	16	21	15	7	04	08.0

	h.	*m.*	*s.*
Longitude by 7 observations of *a* Aquilæ	7	04	14.7
Longitude by 8 observations of Antares	7	04	22.4
Mean..............................	7	04	18.5

APPENDIX No. 5—Continued.

September 1, 1846.—*Santa Fe.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Coronæ Borealis.			Chronometer fast.
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	
3	39	17.8	97	57	35	
3	30	52.0	97	20	00	
3	31	40.1	97	00	15	
3	32	32.5	96	39	10	
3	33	32.0	96	14	30	
3	34	26.0	95	53	10	
3	36	32.1	95	01	30	

Time, p. m.			Double altitudes of *a* Aquarii in the east.			Chronometer fast.
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	
3	53	23.8	92	10	30	
3	54	28.6	92	34	00	
3	55	16.5	92	51	40	
3	56	07.6	93	09	50	
3	77	08.8	93	31	20	
3	57	50.5	93	46	30	
3	58	34.3	94	02	15	

Thermometer 70°.

APPENDIX No. 5—Continued.

September 4, 1846.—*Camp* 49, *on the Rio Del Norte, near Alalavo.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Aquilæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h*	*m.*	*s.*
2	41	22.8	108	33	40	7	37	03.0
2	42	06.5	108	46	35	7	37	04.0
2	43	00.5	109	02	40	7	37	04.7
2	43	42.0	109	14	55	7	37	05.4

Thermometer 64°.

Time, p. m.			Double altitudes of Arcturus in the west.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
2	53	28.8	69	52	00	7	37	06.2	
2	54	15.5	69	34	15	7	37	07.5	
2	55	10.0	69	09	20	7	37	03.2	rej
2	56	11.9	68	45	40	7	33	07.2	
2	57	07.0	68	23	00	7	37	06.9	
2	58	09.8	67	57	55	7	37	08.5	
2	59	04.0	67	35	35	7	37	08.0	
2	59	58.4	66	13	00	7	37	07.2	
3	00	49.0	65	52	50	7	37	07.7	

Thermometer 64°.

	h.	*m.*	*s.*
Chronometer fast by 4 obs. of east star	7	37	04.2
Chronometer fast by 8 obs. of west star			07.4
Mean	7	37	05.8

APPENDIX No. 5—Continued.

September 4, 1846.—*Camp* 49, *on the Rio del Norte, near the Alalavo.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	06	11.0	69	51	35	35	11	19
3	07	08.0	69	52	25	35	11	21
3	08	35.5	69	53	35	35	11	17
3	09	45.0	69	54	20	35	11	18
3	10	51.3	69	55	10	35	11	17
3	11	48.5	69	56	00	35	11	20
3	12	44.0	69	56	30	35	11	13
3	13	20.0	69	57	10	35	11	20
3	13	56.8	69	57	55	35	11	32
3	14	54.5	69	58	30	35	11	21
3	15	30.3	69	59	00	35	11	22
3	16	19.0	69	59	40	35	11	25
3	17	03.4	70	00	00	35	11	18

Thermometer 64°.

Mean of 13 observations, 35° 11′ 20″

APPENDIX No. 5—Continued.

September 6, 1846.—*Peralta, about* 500 *feet north of the Charoi chapel.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Coronæ Borealis.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	36	42.2	87	58	00	7	37	15.9
3	37	43.6	87	31	55	7	37	13.6
3	38	44.0	87	07	45	7	37	14.9
3	39	37.1	86	46	15	7	37	15.4
3	40	42.5	86	19	45	7	37	15.8
3	41	46.0	85	53	10	7	37	14.4
3	43	09.0	85	19	00	7	37	13.7
3	44	14.3	84	51	50	7	37	12.5
3	45	01.2	84	33	20	7	37	14.0
3	46	12.8	84	03	50	7	37	13.4
3	47	12.3	83	39	40	7	37	13.6
3	48	03.8	83	18	50	7	37	14.1

Thermometer 60°.

Mean of 12 observations, 7*h.* 37*m.* 14.28*s.*

APPENDIX No. 5—Continued.

September 6, 1846.—*Peralta.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	53	54.0	69	54	30	34	50	49
3	56	13.5	69	56	30	34	50	55
3	57	39.0	69	57	10	34	50	56
3	58	52.8	69	58	40	34	50	56
4	00	03.7	69	59	40	34	50	59
4	01	09.2	70	00	45	34	51	06
4	02	16.8	70	01	20	34	50	57
4	11	29.2	70	07	55	34	50	58
4	12	37.5	70	09	40	34	51	05
4	13	30.2	70	10	00	34	50	59
4	14	51.0	70	10	50	34	50	47
4	15	52.5	70	11	55	34	50	55
4	16	58.1	70	13	00	34	51	03

Thermometer 56°.

Mean of 13 observations, 34° 50′ 57″.

APPENDIX No. 5—Continued.

September 6, 1846.—*Peralta.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Pegasi in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	36	53.8	91	52	10	7	37	15.2
4	37	44.5	92	12	10	7	37	15.1
4	38	31.5	92	31	00	7	37	14.3
4	39	14.0	92	47	50	7	37	14.0
4	40	03.9	93	07	30	7	37	13.8
4	41	16.3	93	35	30	7	37	14.9
4	42	16.5	93	59	40	7	37	13.5
4	43	30.8	94	29	10	7	37	12.5
4	44	29.7	94	51	40	7	37	13.9

	h.	*m.*	*s.*
Chronometer fast by 9 obs. of east star	7	37	14.13
Chronometer fast by 12 obs. of west star..........			14.28
Mean....................................	7	37	14.20

APPENDIX No. 5—Continued.

September 10, 1846.—*Camp* 55, *on the Rio del Norte, about one mile south of San Felippe.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	01	13.1	70	34	10	35	24	47 rej.
3	02	04.2	70	36	10	35	25	37
3	02	56.2	70	36	50	35	25	37
3	03	42.8	70	37	30	35	25	35
3	04	25.5	70	37	30	35	25	32
3	05	25.5	70	38	40	35	25	33
3	06	11.1	70	39	15	35	25	33
3	07	35.2	70	40	05	35	25	23
3	08	48.0	70	40	40	35	25	15

Thermometer 52°.

Mean of 8 observations, 35° 25′ ″30.

APPENDIX No. 5—Continued.

September 10, 1846.—*Camp* 55.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Coronæ Borealis in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	13	37.8	89	47	05	7	36	06.6
3	16	43.0	89	20	50	7	36	07.3
3	17	34.9	88	59	40	7	36	07.1
3	18	28.7	88	37	45	7	35	06.7
3	19	30.7	88	12	50	7	36	08.6
3	20	37.4	87	44	45	7	36	05.3
3	21	27.0	87	24	15	7	36	04.6

Time, p. m.			Double altitudes of *a* Pegasi in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	47	10.1	78	32	10	7	36	03.4
3	48	00.0	78	51	30	7	36	05.2
3	48	37.5	79	14	20	7	36	05.7
3	50	07.5	79	42	10	7	36	06.3
3	51	04.2	80	05	50	7	36	05.8
3	51	44 5	80	21	20	7	36	05.4
3	52	48.5	80	46	50	7	36	05.4
3	53	49.8	81	11	05	7	39	05.4

Thermometer 52°.

	h.	*m.*	*s.*
Chronometer fast by 8 obs. of east star............	7	36	05.19
Chronometer fast by 7 obs. of west star...........			06.60
Mean....................................	7	36	05.90

APPENDIX No. 5—Continued.

September 13, 1846.—*Santa Fe.*

DETERMINATION OF TIME.

Time, a. m.			Double altitudes of sun's upper limb.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	31	12.0	76	30	00	7	33	54.2
4	31	39.8	76	40	00	7	33	54.4
4	32	07.5	76	50	00	7	33	54.3
4	32	35.8	77	00	00	7	33	54.9
4	33	02.3	77	10	00	7	33	53.6
4	33	32.0	77	20	00	7	33	55.5
4	34	00.2	77	30	00	7	33	55.9
4	34	27.2	77	40	00	7	33	55.0
4	34	54.8	77	50	00	7	33	54.7
4	35	22.7	78	00	00	7	33	55.7
4	35	51.1	78	10	00	7	33	55.1
4	36	19.0	78	20	00	7	33	55.1
4	36	46.5	78	30	00	7	33	54.6

Thermometer 59°.

Mean of 13 observations, 7*h.* 33*m.* 54.78*s.*

DETERMINATION OF INDEX ERROR.

	Min.	*sec.*	*Min.*	*sec.*
On the arc......................	31	20	31	40
Off the arc......................	31	50	31	50

Index error = + 10″.

APPENDIX No. 5—Continued.

September 13, 1846.—*Santa Fe.*

DETERMINATION OF TIME.

Time, a. m.			Double altitudes of sun's upper limb.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
10	53	10.2	67	10	00	7	33	53.4
10	53	37.5	67	00	00	7	33	54.1
10	54	03.0	66	50	00	7	33	53.1
10	54	30.3	66	40	00	7	33	53.8
10	54	56.3	66	30	00	7	33	53.3
10	55	22.7	66	20	00	7	33	53.2
10	55	49.0	66	10	00	7	33	53.0
10	56	15.2	66	00	00	7	33	52.7
10	56	41.0	65	50	00	7	33	52.0
10	57	08.4	65	40	00	7	33	53.1
10	57	36.5	65	30	00	7	33	54.7
10	58	01.0	65	20	00	7	33	52.7
10	58	29.2	65	10	00	7	33	54.5

Thermometer 74°.

Mean of 13 observations, 7*h*. 33*m*. 53.50*s*.

APPENDIX No. 5—Continued.

September 17, 1846.—*Santa Fe.*

Time, a. m., Sept. 18.			Double altitudes of sun's upper limb.		Time, p. m.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*
4	48	02.0	80	20	10	09	13.0
4	47	32.8	80	10	10	09	42.6
4	47	02.0	80	00	10	10	11.0
4	46	34.0	79	50	10	10	42.0
4	46	04.2	79	40	10	11	10.2
4	45	36.0	79	30	10	11	39.5
4	45	06.8	79	20	10	12	09.4
			79	10	10	12	38.8
			79	00	10	13	07.5
Thermometer 68°					Thermometer 72°		

APPENDIX No. 5—Continued.

September 17, 1846.—Santa Fe.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquarii, near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	02	37.0	96	06	55	35	40	34
5	04	14.0	96	08	40	35	40	35
5	05	29.0	96	09	30	35	40	44
5	06	48.9	96	10	20	35	40	46
5	08	05.5	96	11	05	35	40	42
5	09	57.5	96	11	20	35	40	47
5	11	39.8	96	11	20	35	40	44
5	13	09.0	96	11	15	35	40	33
5	14	29.5	96	09	55	35	40	51
5	16	00.0	96	08	50	35	40	50
5	17	29.8	96	07	20	35	40	50
5	19	06.8	96	05	10	35	40	55

Thermometer 60°.

Mean of 12 observations, 35° 40′ 44″.

APPENDIX No. 5—Continued.

September 17, 1846.—*Santa Fe.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	26	53.8	73	16	20	35	41	11
5	28	25.8	73	17	20	35	41	12
5	29	40.0	73	18	15	35	41	18
5	30	59.5	73	19	20	35	41	26
5	32	11.0	73	20	20	35	41	34
5	33	48.0	73	21	10	35	41	30
5	35	31.8	73	22	40	35	41	43
5	36	37.8	73	23	35	35	41	45
5	39	05.5	73	24	15	35	41	26
5	41	01.0	73	25	40	35	41	34

Thermometer 60°.

Mean of 9 observations, 35° 41′ 30″.

By North Star.						By South Star.					
	Deg.	*min.*	*sec.*				*Deg.*	*min.*	*sec.*		
Aug. 19	35	41	13	7	obs.	Aug. 25	35	40	32	15	obs.
" 20	35	41	18	9	"	" 29	35	41	01	11	"
" 29	35	41	33	9	"	" 29	35	40	57	14	"
Sept. 17	35	41	30	9	"	Sept. 17	35	40	44	12	"
Mean	35	41	23.5			Mean	35	40	48.5		

Mean of north and south 35° 41′ 06″, latitude of Santa Fe.

APPENDIX No. 5—Continued.

September 18, 1846.—*Santa Fe.*

Time, a. m.			Double altitudes of sun's upper limb.	
h.	*m.*	*s.*	*Deg.*	*min.*
4	45	06.8	79	20
4	45	36.0	79	30
4	46	04.2	79	40
4	46	34.0	79	50
4	47	02.0	80	00
4	47	32.8	80	10
4	48	02.0	80	20
4	48	30.5	80	30
4	49	00.5	80	40
4	49	30.0	80	50
4	49	58.0	81	00

Thermometer 68°.

APPENDIX No. 5—Continued.

September 21, 1846.—*Santa Fe.*

DETERMINATION OF TIME.

Time, a. m.—Sept. 22.	Double altitudes of sun's upper limb.	Time, p. m.	**Chronometer fast.**
h. m. s.	*Deg. min.*	*h. m. s.*	*h. m. s.*
4 41 28.5	76 20	10 12 47.0	**7 33 38.18**
4 40 58.6	76 10	10 13 14.8	**7 33 37.26**
4 40 29.2	76 00	10 13 46.2	**7 33 38.39**
4 40 01.0	75 50	10 14 14.3	**7 33 38.48**
4 39 31.5	75 40	10 14 42.9	**7 33 38.16**
4 39 03.0	75 30	10 14 12.6	**7 33 38.99**
Thermom. 65.		Thermom. 74°.	

Mean of 1 observations, 7*h*. 33*m*. 38.24*s*.

APPENDIX No. 5—Continued.

September 22, 1846.—Santa Fe.

Time, a. m.			Double altitudes of sun's upper limb.	
h.	*m.*	*s.*	*Deg.*	*min.*
4	38	38.8	75	20
4	39	03.0	75	30
4	39	31.5	75	40
4	40	01.0	75	50
4	40	29.2	76	00
4	40	58.6	76	10
4	41	28.5	16	20
4	41	59.5	76	30
4	42	27.5	76	40
4	42	57.0	76	50
Lost by clouds.			77	00

Thermometer 65°.

APPENDIX No. 5—Continued.

September 23, 1846.—*Santa Fe.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
5	03	21.8	119	03	15	7	33	35.7	
5	04	29.0	119	30	35	7	33	35.6	
5	05	29.0	119	54	40	7	33	36.3	
5	06	36.8	120	22	45	7	33	34.9	
5	07	27.0	120	42	10	7	33	37.2	
5	08	10.8	121	04	05	7	33	36.0	
5	09	11.0	121	22	10	7	33	42.6	rej.
5	09	54.1	121	41	25	7	33	38.2	
5	10	36.3	121	58	55	7	33	37.2	
5	11	36.5	122	23	50	7	33	36.0	

Thermometer 62°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
5	14	47.5	101	07	00	7	33	37.3	
5	15	44.0	100	43	50	7	33	33.4	rej.
5	16	32.8	100	26	20	7	33	36.5	
5	17	20.5	100	07	30	7	33	34.9	
5	18	10.5	99	48	20	7	33	34.9	
5	19	01.8	99	27	55	7	33	32.8	rej.
5	19	51.0	99	10	05	7	33	35.4	
5	20	52.8	88	46	20	7	33	35.0	
5	21	49.5	98	25	20	7	33	36.1	

Thermometer 62°.

	h.	*m.*	*s.*
Chronometer fast by 9 obs. of east star..................	7	33	36.34
Chronometer fast by 7 obs. of west star..................	7	33	35.81
Mean..	7	33	36.08

APPENDIX No. 5—Continued.

September 30, 1846.—*Camp* 62, *seven miles below Isolett, west bank Rio del Norte.*

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of Antares from moon's western limb.			Longitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	04	20.8	67	11	30	7	08	40.9
3	06	18.6	67	12	15	7	09	06.1
3	11	05.8	67	13	20	7	06	41.4
3	14	13.5	67	14	20	7	07	44.3
3	16	04.2	67	14	50	7	07	25.4
3	18	14.5	67	15	40	7	07	53.7
3	20	08.5	67	16	30	7	08	37.8
3	21	48.5	67	17	05	7	08	47.2

Thermometer 48°.

Time, p. m.			Distance of α Pegasi from moon's western limb.			Longitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	36	07.5	38	56	10	7	04	55.2
3	38	19.2	38	55	00	7	05	44.7
3	39	58.8	38	54	30	7	05	21.3
3	43	32.0	38	53	20	7	04	52.6
3	44	47.5	38	52	30	7	05	44.7
3	49	21.8	38	50	55	7	05	21.3
3	50	53.0	38	50	25	7	05	05.6
3	53	04.0	37	49	40	7	04	50.0

Thermometer 48°.

	h.	*m.*	*s.*
Longitude by 8 observations of Antares	7	08	07.10
Longitude by 8 observations of α Pegasi		05	14.42
Mean	7	06	40.76

APPENDIX No. 5—Continued.

September 30, 1846.—*Camp* 62.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	06	17.5	105	51	05	7	36	24.0
4	07	04.8	106	10	45	7	36	23.5
4	07	54.0	106	31	35	7	36	22.0
4	08	47.6	106	54	05	7	36	20.8
4	09	30.0	107	10	30	7	36	23.4
4	10	23.8	107	33	05	7	36	21.3
4	11	21.9	107	56	25	7	36	25.6

Thermometer 48°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	25	41.8	109	55	15	7	36	25.7
4	26	44.0	109	31	25	7	36	25.2
4	27	28.8	109	13	50	7	36	24.7
4	28	12.0	108	57	00	7	36	24.5
4	28	55.8	108	40	10	7	36	22.9
4	29	45.0	108	20	50	7	36	24.2
4	30	39.0	107	59	55	7	36	23.4

Thermometer 48°.

	h.	*m.*	*s.*
Chronometer fast by 7 observations of east star ...	7	36	22.66
Chronometer fast by 7 observations of west star...			24.37
Mean..	7	36	23.52

APPENDIX No. 5—Continued.

September 30, 1846.—*Camp* 62.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	35	38.0	71	29	50	34	48	28
4	42	11.0	71	34	00	34	48	34
4	43	09.0	71	34	40	34	48	36
4	44	10.0	71	35	20	34	48	37
4	44	46.0	71	35	40	34	48	34
4	45	18.5	71	36	05	34	48	36
4	46	16.8	71	36	35	34	48	34
4	47	21.5	71	36	55	34	48	24

Thermometer 48°.

Mean of 8 observations, 34° 48′ 33″.

APPENDIX No. 5—Continued.

October 4, 1846.—Camp 65, west bank Rio del Norte, about two miles below Linitans.

LUNAR DISTANCE.

Time, p. m.			Fomalhaut and moon's western limb.			Double altitudes of moon's lower limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	04	09.8	47	15	50	66	37	10
4	06	01.8	47	15	50	67	20	40
4	07	09.2	47	16	35	67	46	20
4	08	53 8	47	17	10	68	27	00
4	11	57.5	47	18	45	69	38	40
4	13	40.0	47	19	10	70	18	50
4	15	32.0	47	20	05	71	01	30
4	17	08.0	47	20	35	71	38	30

Time, p. m.			Aldebaran and moon's western limb.			Double altitudes of moon's lower limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	28	56.5	51	59	05	76	09	40
4	31	05.0	51	58	40	76	58	40
4	32	46.0	51	57	45	77	36	10
4	34	43.0	51	56	30	78	19	50
4	36	58.0	51	56	10	79	10	30
4	38	35.0	51	55	35	79	47	50
4	40	27.0	51	54	55	80	38	50
4	41	41.5	51	54	10	80	57	00
4	43	13.0	51	53	40	81	31	30

Thermometer 60°

APPENDIX No. 5—Continued.

October 4, 1846.—*Camp* 65, *west bank of the Rio del Norte.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
2	22	50.5	68	42	50	34	07	27
2	24	00.0	68	44	00	34	07	34
2	24	50.0	68	44	55	34	07	42
2	26	07.8	68	45	55	34	07	40
2	27	14.2	68	46	50	34	07	42
2	28	16.2	68	47	45	34	07	45
2	28	58.0	68	48	20	34	07	46
2	30	09.8	68	49	10	34	07	47
2	30	58.7	68	49	50	34	07	44
2	31	36.5	68	50	10	34	07	39
2	32	19.8	68	50	35	34	07	34
2	33	09.0	68	51	10	34	07	32

Thermometer 64°.

Mean of 12 observations, 34° 07′ 59″.

APPENDIX No. 5—Continued.

October 4, 1846.—Camp 65, west bank of the Rio del Norte.

DETERMINATION OF TIME.

Time, p. m.	Double altitudes of *a* Andromedæ in the east.	Chronometer fast.
h. m. s.	*Deg. min. sec.*	*h. m. s.*
3 01 27.9	85 21 25	7 36 51.0
3 02 21.8	85 43 50	7 36 49.7
3 03 01.2	85 58 30	7 36 53.8 rej.
3 03 54.0	86 21 15	7 36 51.1
3 04 42.5	86 41 25	7 36 50.5
3 07 23.0	87 45 45	7 36 50.2
3 08 23.0	88 12 05	7 36 50.1
3 09 10.5	88 31 50	7 36 49.6
3 09 45.8	88 46 20	7 36 49.5
3 10 31.5	89 04 50	7 36 50.1

Thermometer 62°.

Time, p. m.	Double altitudes of *a* Lyræ in the west.	Chronometer fast.
h. m. s.	*Deg. min. sec.*	*h. m. s.*
3 46 00.0	118 58 50	7 36 52.2
3 46 58.8	118 35 35	7 36 51.3
3 47 59.0	118 12 50	7 36 53.5
3 48 57.5	117 49 50	7 36 53.1
3 49 43.8	117 32 25	7 36 54.7
3 50 31.7	117 12 30	7 36 51.7
3 51 14.8	116 56 25	7 36 53.6
3 52 09.8	116 34 45	7 36 53.1

Thermometer 62°.

	h.	*m.*	*s.*
Chronometer fast by 9 observations of east star	7	36	50.20
" " 8 " west star			52.90
Mean....................	7	36	51.56

APPENDIX No. 5—Continued.

October 5, 1846.—*Camp* 66, *near Socorro.*

Time, p. m.			Double altitudes of *a* Andromedæ.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
3	36	56.2	101	37	30
3	38	15.8	102	10	10
3	38	58.7	102	28	25
3	39	47.5	102	38	25
3	40	46.8	103	13	10
3	41	30.0	103	31	05
3	42	05.5	103	46	50

Time, p. m.			Double altitudes of *a* Lyræ in the west.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
3	46	28.0	117	10	35
3	47	29.7	116	47	00
3	48	22.0	116	26	05
3	49	19.5	116	04	00
3	50	12.8	115	43	35
3	51	10.1	115	22	10
3	51	58.5	115	02	40

Thermometer 58°.

APPENDIX No. 5—Continued.

October 7, 1846.—*Camp* 68, *west bank of the Rio del Norte.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	38	30.5	130	21	55	7	37	02.3
4	39	38.2	130	50	05	7	37	02.2
4	40	37.8	131	14	15	7	37	03.6
4	41	30.5	131	36	30	7	37	02.7
4	42	27.0	132	00	20	7	37	01.8
4	43	11.5	132	19	10	7	37	01.3
4	43	55.7	132	37	05	7	37	01.9

Thermometer 62°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	47	29.0	90	21	10	7	37	06.4
4	48	06.0	90	06	40	7	37	05.6
4	49	02.0	89	45	25	7	37	06.0
4	49	51.8	89	26	05	7	37	05.5
4	50	38.7	89	08	50	7	37	07.2
4	51	37.8	88	45	50	7	37	06.2
4	52	31.4	88	24	55	7	37	05.2
4	53	20.0	88	06	00	7	34	04.2
4	54	06.0	87	49	00	7	37	05.8

Thermometer 62°.

	h.	*m.*	*s.*
Chronometer fast by 7 obs. of east star...........	7	37	02.26
Chronometer fast by 9 obs. of west star			05.79
Mean..................................	7	37	04.02

APPENDIX No. 5—Continued.

October 7, 1846.—Camp 68, west bank of the Rio del Norte.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	20	51.2	69	53	45	33	41	04
5	22	12.8	69	54	45	33	41	16
5	23	18.0	69	55	10	33	41	16
5	23	46.0	69	55	30	33	41	20
5	24	37.0	69	55	50	33	41	20
5	25	26.0	69	56	10	33	41	18
5	26	03.5	69	56	35	33	41	22
5	26	45.0	69	56	50	33	41	21
5	27	24.0	69	57	05	33	41	20
5	28	09.5	69	57	20	33	41	18

Mean of 9 observations, 33° 41′ 19″.

APPENDIX No. 5—Continued.

October 10, 1846.—*Camp* 70.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquilæ near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	34	46.0	100	46	50	35	19	19
3	35	56.5	100	48	00	33	19	45
3	37	15.5	100	49	55	33	19	36
3	38	38.2	100	51	10	33	19	41
3	39	49.0	100	51	30	33	19	50
3	40	57.5	100	53	10	33	19	28
3	41	57.5	100	54	10	33	19	10
3	43	12.8	100	54	35	33	19	05
3	45	12.5	100	53	50	33	19	24
3	46	15.0	100	53	05	33	19	36
3	47	02.0	100	52	20	33	19	47
3	47	51.2	100	51	50	33	19	45
3	48	58.8	100	51	10	33	19	41
3	50	19.0	100	49	40	33	19	45
3	51	55.2	100	47	40	33	19	45
3	52	54.5	100	46	20	33	19	42
3	54	32.8	100	42	40	33	19	68

Thermometer 48°

Mean of 17 observations, 33° 19′ 38″.

APPENDIX No. 5—Continued.

October 10, 1846.—*Camp* 70.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	02	30.2	68	36	35	33	20	15
4	03	47.0	68	37	50	33	20	29
4	05	11.2	68	38	05	33	20	11
4	05	54.5	68	38	50	33	20	19
4	06	44.0	68	39	55	33	20	37
4	07	31.3	68	40	10	33	20	30
4	08	19.2	68	40	40	33	20	30
4	09	12.5	68	41	10	33	20	28
4	09	43.5	68	41	25	33	20	26
4	10	34.0	68	41	50	33	20	24
4	11	15.5	68	42	30	33	20	31
4	12	08.5	68	43	10	33	20	36
4	13	03.0	68	43	00	33	20	14
4	14	05.0	68	44	00	33	20	25
4	14	45.8	68	44	20	33	20	24
4	15	20.8	68	44	35	33	20	21
4	15	56.8	68	44	50	33	20	19

	Latitude of Camp.		
	Deg.	*min.*	*sec.*
Latitude, by 17 observations of *b* Aquarii........	33	19	38
Latitude, by 17 observations of Polaris...........	33	20	25
Mean	33	20	02

APPENDIX No. 5—Continued.

r 10, 1846.—*Camp 70, east side of the Rio del Norte.*

DETERMINATION OF TIME.

, p. m.		Double altitudes of sun's upper limb.		Chronometer fast.		
.	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*
1	7.5	75	30	7	37	42.5
1	39.2	75	40	7	37	41.9
2	12.8	75	50	7	37	42.6
2	45.0	76	00	7	37	42.0
3	18.0	76	10	7	37	42.0
3	51.8	76	20	7	37	42.8
4	23.5	76	30	7	37	42.5
4	56.9	76	40	7	37	41.8
5	30.5	76	50	7	37	42.2
6	03.0	77	00	7	37	41.5

Thermometer 68°.

Mean of 10 observations, 7*h.* 37*m.* 42.18*s.*

APPENDIX No. 5—Continued.

October 10, 1846.—Camp 70.

DETERMINATION OF TIME.

Equal altitudes of sun.

Time, a. m.—Oct. 11.			Double altitudes of sun's upper limb.		Time, p. m.—Oct. 10.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s.*	*h.*	*m.*	*s.*
4	57	49.3	74	00	9	52	44.5	7	37	37.67
4	57	18.2	73	50	9	53	16.0	7	37	38.07
4	56	45.0	73	40	9	53	49.0	7	37	38.16
4	56	12.5	73	30	9	54	20.8	7	37	38.00
4	55	41.5	73	20	9	54	51.0	7	37	37.79
4	55	09.2	73	10	9	55	25.5	7	37	38.07
4	54	37.3	73	00	9	55	56.0	7	37	38.55
4	54	04.7	72	50	9	56	26.3	7	37	37.59
4	53	33.5	72	40	9	56	59.0	7	37	38.50
4	53	01.0	72	30	9	57	30.0	7	37	37.90
4	52	28.8	72	20	9	58	01.2	7	37	37.63
4	51	25.3	72	00	9	59	04.5	7	37	37.87

Mean of 12 observations, 7*h.* 37*m.* 37.99*s.*

DETERMINATION OF INDEX ERROR.

	m.	*s.*
On the arc	31	30
Off the arc	31	50

Index error = 10″.

APPENDIX No. 5—Continued.

October 11, 1846.—*Camp* 70.

DETERMINATION OF TIME.

Equal altitudes of the sun.

Time, a. m.			Double altitudes of sun's upper limb.		Time, p. m.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*h.*	*m.*	*s*	*h.*	*m.*	*s.*	
4	51	25.3	72	00	9	56	54.5	7	37	35.60	
4	51	57.0	72	10	9	56	21.7	7	37	35.05	
4	52	28.8	72	20	9	55	50.3	7	37	35.25	
4	53	01.0	72	30	9	55	19.0	7	37	35.70	
4	53	33.5	72	40	9	54	46.0	7	37	35.45	
4	54	04.7	72	50	9	54	18.8	7	37	37.45	rej.
4	54	37.3	73	00	9	53	43.0	7	37	35.85	
4	55	09.2	73	10	9	53	09.0	7	37	34.80	
4	55	41.5	73	20	9	52	38.5	7	37	35.70	
4	56	12.5	73	30	9	52	05.8	7	37	34.85	
4	56	45.0	73	40							
4	57	18.2	73	50							
4	57	49.3	74	00							
Ther. 60°.					Ther. 80 .						

Mean of 9 observations, 7*h.* 37*m.* 55.36*s.*

APPENDIX No. 5—Continued.

October 12, 1846.—*Camp* 70.

DETERMINATION OF TIME.

Time p. m.			Double altitudes of *α* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	07	55.0	100	34	25	7	37	39.1
3	09	03.8	101	01	50	7	37	32.1 rej.
3	10	07.5	101	30	10	7	37	27.8
3	11	07.8	101	55	40	7	37	27.0
3	12	08.2	102	19	25	7	37	30.4 rej.
3	13	31.2	102	55	30	7	37	26.9
3	14	29.8	103	20	10	7	37	26.4
3	15	43.8	103	50	05	7	37	28.7
3	16	40.5	104	14	00	7	37	28.2
3	17	27.2	104	33	10	7	37	28.9

Thermometer 42°.

Time, p. m.			Double altitudes of *α* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s*
3	21	45.0	115	52	10	7	37	31.9
3	22	26.8	115	35	40	7	37	31.5
3	23	06.0	115	20	30	7	37	31.9
3	23	49.8	115	03	20	7	37	31.7
3	24	40.2	114	43	30	7	37	31.3
3	25	27.8	114	24	50	7	37	31.2
3	26	15.8	114	06	10	7	37	32.5
3	27	02.0	113	48	20	7	37	31.9
3	28	05.5	113	22	50	7	37	30.2

Thermometer 42°.

	h.	*m.*	*s.*
Chronometer fast by 8 obs. of east star...........	7	37	27.88
Chronometer fast by 9 obs. of west star..........	7	37	31.57
Mean	7	37	29.72

APPENDIX No. 5—Continued.

October 30, 1846.—*Camp* 70.

Time, p. m.			Double altitudes of *a* Lyræ in the west.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
3	46	40.8	104	32	30
3	47	47.3	104	07	30
3	48	49.0	103	43	40
3	49	51.2	103	20	20
3	50	36.5	103	01	50
3	51	40.5	102	37	10

Thermometer 42°.

APPENDIX No. 5—Continued.

October 13, 1846.—*Camp* 71, *west side of the Rio del Norte.*

Time, p. m.			Double altitudes of *a* Andromedæ.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
3	37	49.1	114	46	00
3	39	17.5	115	23	10
3	40	14.0	115	45	45
3	41	17.3	116	12	30
3	42	08.0	116	34	15
3	42	57.8	116	54	40

Thermometer 42°.

APPENDIX No. 5—Continued.

October 15, 1846.—*Camp* 73, *on a small stream—first camp after leaving the Del Norte.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	57	13.2	108	39	15	8	19	06.7
3	58	20.8	109	08	15	8	19	05.2
3	59	04.2	109	27	10	8	19	03.6 rej.
3	59	45.7	109	44	00	8	19	05.0
4	00	32.5	110	03	30	8	19	05.4
4	01	20.7	110	23	05	8	19	07.8
4	01	58.5	110	38	40	8	19	07.7

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	22	34.5	103	28	35	8	19	10.6.
4	23	35.0	103	04	40	8	19	09.6
4	24	41.2	102	38	40	8	19	08.9
4	25	24.5	102	22	20	8	19	10.2
4	26	19.5	102	01	20	8	19	11.2
4	26	57.1	101	47	05	8	19	12.1
4	27	47.6	101	27	45	8	19	12.3

Thermometer 66°.

	h.	*m.*	*s.*
Chronometer fast by 6 observations of east star	8	19	06.30
" " 7 " west star	8	19	10.70
Mean......................	8	19	08.50

APPENDIX No. 5—Continued.

October 15, 1846.—*Camp* 73.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	07	21.8	67	34	40	32	54	37 rej.
4	08	05.2	67	35	40	32	54	53
4	08	57.5	67	36	20	32	54	56
4	09	33.5	67	36	50	32	54	59
4	10	30.0	67	37	45	32	55	08
4	11	25.8	67	38	10	32	55	04
4	12	26.5	67	39	15	32	55	15
4	13	50.0	67	39	55	32	55	10
4	14	30.0	67	40	10	32	55	04

Mean of 8 observations, 32° 55′ 04″.

APPENDIX No. 5—Continued.

October 17, 1846.—*Camp* 75.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	35	11.8	99	49	50	8	25	5319
3	36	11.8	100	14	55	8	25	54.0
3	36	58.0	100	35	10	8	25	51.8
3	37	49.5	100	56	10	8	25	53.2
3	38	38.5	101	16	40	8	25	53.4
3	39	30.0	101	38	15	8	25	53.3
3	40	13.5	101	55	50	8	25	54.9

Thermometer 38°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	45	10.2	117	29	55	8	25	57.8
3	46	15.2	117	03	30	8	25	55.3
3	47	06.8	116	43	50	8	25	56.6
3	47	56.2	116	24	20	8	25	46.2
3	48	56.2	116	00	25	8	25	54.9
3	49	47.8	115	40	25	8	25	55.4
3	51	16.0	115	06	25	8	25	56.8

	h.	*m.*	*s.*
Chronometer fast by 7 observations of east star....	8	25	53.50
Chronometer fast by 7 observations of west star....	8	25	56.14
Mean..............................	8	25	54.82

APPENDIX No. 5—Continued.

October 17, 1846.—*Camp* 75.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquarii near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	57	57.0	102	04	40	32	42	18
3	59	04.0	102	05	50	32	42	08
4	00	13.0	102	07	00	32	42	03
4	01	40.0	102	07	50	32	42	05
4	02	54.4	102	08	30	32	41	59
4	03	56.0	102	08	05	32	42	18
4	05	00.0	102	08	10	32	42	16
4	06	16.5	102	07	55	32	42	15
4	07	22.0	102	07	40	32	42	10
4	08	17.0	102	07	25	32	42	02
4	09	33.0	102	06	35	32	41	58
4	10	46.5	102	04	50	32	42	15
4	11	44.0	102	03	25	32	42	22

Thermometer 38°.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	16	53.8	67	16	30	32	42	09
4	18	04.0	67	16	50	32	41	58
4	18	47.2	67	17	50	32	42	15
4	19	45.0	67	18	30	32	42	17
4	20	57.8	67	18	50	32	42	03
4	21	50.0	67	19	25	32	42	05
4	22	36.0	67	20	20	32	42	18
4	23	10.5	67	20	40	32	42	17
4	23	42.0	67	21	15	32	42	26

Thermometer 38°.

	Latitude of camp.		
	Deg.	*min.*	*sec.*
Latitude by 13 observations of *b* Aquarii	32	42	10
" 9 " Polaris..............	32	42	12
Mean............................	32	42	11

APPENDIX No. 5—Continued.

October 19, 1846.—*Camp* 77.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
5	10	51.3	82	39	10	8	28	01.6
5	11	42.0	81	50	00	8	28	02.0
5	12	29.9	81	32	10	8	28	03.0
5	13	20.8	81	13	10	8	28	04.1
5	14	03.0	80	56	40	8	28	02.9
5	15	06.8	80	32	40	8	28	03.7
5	16	16.0	80	05	55	8	28	02.6

Thermometer 50°.

Mean of 7 observations, 8*h.* 28*m.* 02.84*s.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	20	51.8	68	11	20	32	50	31
5	21	48.0	68	12	20	32	50	46
5	22	49.5	68	12	40	32	50	40
5	23	34.2	68	13	30	32	50	55
5	24	12.0	68	14	00	32	50	61
5	25	43.8	68	14	40	32	50	59
5	26	27.5	68	15	20	32	50	70
5	27	15.0	68	15	30	32	50	66
5	28	51.0	68	15	40	32	50	55

Thermometer 50°.

Mean of 9 observations, 32° 50′ 54″.

APPENDIX No. 5—Continued.

October 20, 1846.—*Camp* 78, *on the Rio Gila.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquarii, near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	50	18.0	101	48	50	32	49	48
3	51	05.8	101	49	40	32	49	50
3	52	01.0	101	50	30	32	49	53
3	52	49.7	101	50	45	32	50	07
3	53	41.0	101	51	50	32	49	52
3	54	28.0	101	51	55	32	50	02
3	55	19.8	101	52	20	32	50	01
3	56	23.0	101	52	50	32	49	54
3	57	25.8	101	52	55	32	49	53
3	58	02.8	101	52	40	32	50	00
3	59	20.8	101	51	50	32	50	16
4	00	15.5	101	51	20	32	50	19
4	01	22.0	101	50	50	22	50	14
4	02	28.2	101	50	20	32	50	03
4	03	06.5	101	49	50	32	50	00
4	04	19.2	101	48	10	32	50	09

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	28	08.0	67	43	20	32	50	01
4	29	05.5	67	44	10	32	50	05
4	29	38.0	67	44	50	32	50	15
4	30	16.8	67	45	20	32	50	21
4	31	07.0	67	45	40	32	50	16
4	31	52.1	67	46	15	32	50	21
4	32	34.0	67	46	30	32	50	15
4	33	12.8	67	46	55	32	50	16
4	33	47.0	67	47	20	32	50	18

Thermometer 50°.

	Latitude of can		
	Deg.	*min.*	*se*
Latitude by 16 observations of *b* Aquarii...........	32	50	0
Latitude by 9 observations of Polaris..............	32	50	1
Mean...........................	32	50	0

APPENDIX No. 5—Continued.

October 20, 1846.—*Camp* 78.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	10	38.3	117	46	30	8	30	29.2
4	11	39.0	118	11	55	8	30	29.6
4	12	25.7	118	31	35	8	30	29.6
4	13	15.0	118	52	35	8	30	29.0
4	14	11.2	119	15	55	8	30	29.8
4	15	04.0	119	39	00	8	30	27.8
4	15	53.0	119	59	40	8	30	27.7

Thermometer 50°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	19	33.8	101	20	05	8	30	29.2
4	20	17.8	101	04	10	8	30	32.2
4	21	00.8	100	47	30	8	30	32.2
4	21	49.7	100	28	20	8	30	31.8
4	22	38.0	100	08	55	8	30	30.0
4	23	17.8	99	53	10	8	30	29.4
4	24	04.0	99	35	35	8	30	30.2

Thermometer 50°.

	h.	*m.*	*s.*
Chronometer fast by 7 observations of east star	8	30	28.96
Chronometer fast by 7 observations of west star		30	30.71
Mean....................................	8	30	29.83

APPENDIX No. 5—Continued.

October 22, 1846.—*Camp* 80, *on the Gila.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquarii, near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	46	12.0	102	10	50	32	38	29
3	47	08.8	112	12	20	32	38	19
3	48	07.5	103	13	30	32	38	15
3	49	02.8	102	14	50	32	37	59
3	49	47.8	102	15	30	32	37	56
3	50	40.7	102	16	25	32	37	55
3	51	24.9	102	16	30	32	37	42
3	52	14.0	102	16	10	32	38	10
3	53	15.8						
3	54	29.0	102	15	55	32	38	21
3	55	17.5	102	15	50	32	38	19
3	56	09.8	102	15	30	32	38	19
3	56	54.0	102	15	00	32	38	23
3	57	38.0	102	14	30	32	38	28
3	58	21.0	102	14	00	32	38	23
3	59	20.5	102	13	20	32	38	16
4	00	18.5	102	12	20	32	38	18
4	01	03.8	102	11	40	32	38	07

Thermometer 62°.

Mean of 12 observations, 32° 38′ 13″.

APPENDIX No. 5—Continued.

October 22, 1846.—*Camp* 80, *on the Gila.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	04	53.8	116	53	05	8	34	42.2
4	05	58.8	117	20	20	8	34	42.6
4	06	51.0	117	43	05	8	34	40.8
4	07	37.0	118	02	20	8	34	41.2
4	08	45.6	118	30	10	8	34	43.9
4	09	37.8	118	53	00	8	34	41.9
4	10	24.8	119	13	10	8	34	41.1

Thermometer 62°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	13	45.0	102	01	25	8	34	42.1
4	14	34.8	101	43	10	8	34	43.2
4	15	25.8	101	23	30	8	34	43.7
4	16	13.2	101	04	30	8	34	44.3
4	16	55.0	100	48	40	8	34	45.4
4	17	43.2	100	29	10	8	34	43.6
4	18	28.0	100	12	00	8	34	44.1

	h.	*m.*	*s.*
Chronometer fast by 7 obs. of east star...........	8	34	41.96
" 7 " west star	8	34	43.77
Mean..........................	8	34	42.86

APPENDIX No. 5—Continued.

October 24, 1846.—*Camp* 81, *on the Gila.*

DETERMINATION OF LONGITUDE.

Time, a. m.			Distance of Fomalhaut from moon's western limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
2	32	14.8			
2	34	03.6	67	42	20
2	35	16.8	67	42	15
2	37	04.5	67	41	45
2	38	39.0	67	40	55
2	39	57.8	67	40	30
2	41	12.5	67	40	05
2	42	38.5	67	39	55
2	44	02.0	67	39	10
2	46	01.0	67	38	20
2	47	17.0	67	37	40
2	48	35.8	67	37	10
2	50	04.0	67	36	50

Thermometer 68°.

Longitude by mean of observations, 7*h*. 12*m*. 17.4*s*.

APPENDIX No. 5—Continued.

October 24, 1846.—*Camp* 81, *on the Gila.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	13	24.8	98	23	55	8	35	05.6
3	14	25.2	98	50	00	8	35	05.8
3	15	15.5	99	10	50	8	35	04.3
3	16	04.7	99	31	30	8	35	04.1
3	16	50.6	99	51	30	8	35	02.2
3	17	41.0	100	11	50	8	35	04.1
3	18	38.0	100	36	15	8	35	03.6
3	19	33.0	100	58	10	8	35	04.3
3	20	17.5	101	17	35	8	35	03.7

Thermometer 54°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h*	*m.*	*s.*
3	23	15.0	118	53	55	8	35	04.5
3	24	01.2	118	37	20	8	35	08.3 rej.
3	24	54.0	118	16	10	8	35	04.5
3	25	34.0	117	59	50	8	35	05.3
3	26	15.5	117	43	20	8	35	04.7
3	26	59.8	117	25	50	8	35	04.3
3	27	40.8	117	09	30	8	35	03.4
3	28	24.0	116	52	30	8	35	05.4
3	29	08.0	116	35	30	8	35	03.7

	h.	*m.*	*s.*
Chronometer fast by 9 observations of east star...	8	35	03.97
Chronometer fast by 8 observations of west star...	8	35	04.48
Mean..	8	35	04.22

APPENDIX No. 5—Continued.

October 24, 1846.—*Camp* 81, *on the Gila.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquarii near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	34	52.0	101	51	50	32	45	03
3	35	59.5	101	53	50	32	44	56
3	37	17.9	101	55	50.	32	45	01
3	38	51.8	101	57	30	32	45	17 rej.
3	40	02.5	102	00	20	32	44	31
3	41	12.0	102	00	40	32	44	57
3	42	21.2	102	02	25	32	44	31
3	43	45.0	103	03	20	32	44	26
3	45	10.8	102	03	15	32	44	41
3	46	30.0	102	03	40	32	44	31
3	47	36.0	102	04	00	32	44	16
3	48	22.8	102	03	10	32	44	34
3	49	13.2	102	03	10	32	44	22
3	50	06.8	102	02	20	32	44	31
3	51	14.2	102	01	40	32	44	28
3	52	10.0	102	00	55	32	44	20
3	53	07.0	102	00	15	32	44	08 rej.
3	54	18.8	101	58	10	32	44	24
3	55	37.6	101	55	25	32	44	45
3	57	13.5	101	52	40	32	44	43

Mean of 18 observations, 32° 44′ 37″.

Latitude by 12 obs. of Polaris.........	32	45	06
Latitude by 18 obs. of *b* Aquarii.......	32	44	37
Mean of north and south stars...	32	44	52 lat. of camp.

APPENDIX No. 5—Continued.

October 24, 1846.—*Camp* 81, *on the Gila.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Dec.*	*min.*	*sec.*
2	56	31.0	66	39	20	32	45	14
2	57	30.5	66	40	20	32	45	14
2	58	18.8	66	40	45	32	45	01
2	58	58.5	66	41	10	32	44	57
2	59	39.2	66	42	00	32	45	06
3	00	34.5	66	42	45	32	45	09
3	01	24.0	66	43	15	32	45	07
3	02	21.5	66	44	10	32	45	13
3	03	18.8	66	44	55	32	45	15
3	03	58.8	66	45	20	32	45	12
3	04	57.0	66	45	50	32	45	08
3	05	55.6	66	46	20	32	44	59

Thermometer 62°.

Mean of 15 observations, 32° 45′ 06″.

APPENDIX No. 5—Continued.

October 26, 1846.—*Camp* 83, *on the Gila*.

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of *a* Pegasi from moon's western limb.			Double altitudes of moon's lower limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	14	49.0	56	00	10	63	59	20
4	16	28.2	55	59	10	63	14	40
4	18	20.8	55	58	30	62	47	00
4	19	43.5	55	58	10	62	26	10
4	22	33.0	55	57	30	61	43	55
4	24	11.8	55	57	10	61	19	20

Thermometer 66°

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of ——— in the west.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
5	19	35.8	96	03	40
5	20	24.0	95	46	20

Time, p. m.			Double altitudes of *a* Lyræ in the west.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
5	25	51.0	70	07	10

APPENDIX No. 5—Continued.

October 27, 1846.—*Camp* 83, *on the Gila.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
2	40	42.0	66	50	10	32	55	11
2	41	27.8	66	50	50	32	55	15
2	42	29.2	66	51	35	32	53	18
2	44	02.0	66	52	50	32	53	18
2	45	15.3	66	53	40	32	53	12
2	46	10.8	66	54	30	32	53	17
2	46	58.5	66	55	10	32	53	20
2	47	46.7	66	55	45	32	53	19
2	48	28.8	66	56	10	32	53	16

Thermometer 51°.

Mean of 9 observations, 32° 53′ 13″.

APPENDIX No. 5—Continued.

October 27, 1846.—*Camp* 83, *on the Gila.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	54	45.6	94	11	05	8	38	24.3
2	55	30.5	94	29	00	8	38	26.3
2	56	16.7	94	48	05	8	38	26.8
2	57	08.5	95	09	05	8	38	28.1
2	57	50.4	95	27	10	8	38	26.8
2	58	36.8	95	47	25	8	38	24.8
2	59	57.8	96	11	45	8	38	26.4
3	00	22.0	96	30	10	8	38	27.6
3	01	08.2	96	49	55	8	38	26.5

Thermometer 51°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
3	28	13.0	113	46	20	8	38	28.4	
3	29	20.2	113	20	05	8	38	28.6	
3	30	13.0	112	59	55	8	38	28.8	
3	31	21.0	112	33	05	8	38	29.2	
3	32	22.0	112	09	05	8	38	28.8	
3	33	11.0	111	48	40	8	38	25.0	rej.
3	33	55.8	111	32	10	8	38	28.0	
3	34	45.0	111	13	05	8	38	28.4	
3	35	33.0	110	54	10	8	38	28.0	

Thermometer 51°.

Mean of 17 observations, 8*h*. 58*m*. 27.46*s*.

APPENDIX No. 5—Continued.

October 27, 1846.—*Camp* 83, *on the Gila.*

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of *a* Pegasi from moon's western limb.			Double altitudes of moon's lower limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	46	05.5	42	43	40	74	31	50
4	47	41.0	42	42	50	74	10	10
4	49	05.5	42	42	30	73	51	40
4	50	53.0	42	42	00	73	27	40
4	54	56.0	42	40	30	72	31	10
4	56	52.5	42	39	35	72	04	40
4	58	34.8	42	38	50	71	40	00
5	00	28.3	43	38	20	71	13	10
5	02	42.0	42	37	20	70	41	00
5	04	09.2	42	37	10	70	19	20
5	05	59.5	42	36	35	69	52	15

Thermometer 50°.

Longitude, by mean of observations, 7*h.* 13*m.* 04.24*s.*

APPENDIX No. 5—Continued.

October 30, 1846.—*Camp* 86, *on the Gila*.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of —— in the east.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
8	26	01.0	98	19	05
8	26	50.0	98	38	10
8	28	23.0	99	14	50

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
8	34	30.5	69	14	50	33	12	05
8	35	46.0	69	14	30	33	12	05
8	36	51.2	69	14	30	33	12	14
8	37	37.8	69	14	10	33	12	11
8	39	01.8	69	15	50	33	12	13
8	40	03.5	69	13	20	33	12	16
8	41	19.0	69	13	05	33	12	11
8	42	55.0	69	12	35	33	12	13
8	44	29.0	69	11	40	33	12	01
8	45	40.5	69	11	20	33	12	04
8	46	27.0	69	11	15	33	12	10
8	47	26.8	69	11	05	33	12	15
8	48	22.7	69	10	45	33	12	17

Thermometer 55°.

Mean of 13 **observations, 33° 12′ 10″.**

APPENDIX No. 5—Continued.

October 30, 1846.—*Camp* 86, *on the Gila.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Aldebaran in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg*	*min.*	*sec.*	*h.*	*m.*	*s.*
8	55	13.8	124	55	50	8	41	02.9
8	56	14.5	125	16	35	8	41	04.9
8	57	24.0	125	41	05	8	41	04.9
8	58	26.8	126	03	30	8	41	03.7
Clouds.								
9	00	44.8	126	51	15	8	41	04.7
9	01	54.0	127	15	15	8	41	04.5
9	03	32.8	127	48	55	8	41	05.1
9	05	35.8	128	31	10	8	41	04.2
9	06	41.9	128	53	15	8	41	05.0

Thermometer 55°.

Mean of 9 observations, 8*h.* 41*m.* 04.43*s.*

APPENDIX No. 5—Continued.

October 30, 1846.—*Camp* 86, *on the Gila.*

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of Aldebaran from moon's western limb.			Double altitudes of moon's lower limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
9	23	27.0	72	07	35	58	47	40
9	25	06.0	72	06	50	58	10	50
9	27	55.8	72	05	35	57	06	30
9	30	03.5	72	04	25	56	18	00
9	31	55.8	72	03	25	55	36	10
9	33	36.0	72	02	40	54	58	20
9	35	27.8	72	01	40	54	15	30
9	37	40.8	72	00	25	53	24	50
9	39	28.8	71	59	30	52	43	20

Thermometer 50°.

APPENDIX No. 5—Continued.

October 31, 1846.—*Camp* 87, *on the San Francisco, about two miles from its mouth.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquarii near the meridian.			Latitude.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*	
3	17	31.8	100	58	50	33	14	29	
3	18	38.7	101	01	00	33	14	04	rej.
3	19	28.5	101	01	20	33	14	19	
3	20	33.5	101	02	05	33	14	25	
3	21	45.0	101	02	50	33	14	26	
3	22	50.9	101	03	30	33	14	22	
3	24	00.7	101	03	45	33	14	25	
3	25	54.2	101	04	10	33	14	13	
3	27	13.7	101	04	30	33	13	53	rej.
3	28	28.0	101	03	10	33	14	15	
3	29	51.5	101	02	10	33	14	16	
3	31	00.0	101	01	00	33	14	20	
3	32	14.2	100	59	45	33	14	16	
3	33	31.5	100	57	40	33	14	27	

Thermometer 50°.

Mean of 12 observations, 33° 14′ 21″.

APPENDIX No. 5—Continued.

October 31, 1846.—*Camp* 87.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h*	*m.*	*s.*
3	40	05.0	118	29	40	8	41	31.2
3	41	18.2	119	01	00	8	41	29.7
3	42	04.2	119	20	00	8	41	30.4
3	43	12.5	119	49	10	8	41	29.2
3	44	13.0	120	13	25	8	41	31.9
3	45	10.8	120	38	20	8	41	30.3
3	46	06.0	121	01	30	8	41	30.3
3	47	01.0	121	24	55	8	41	29.4
3	48	05.8	121	51	40	8	41	30.5

Thermometer 50°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	57	51.0	97	34	30	8	41	32.8
3	58	41.8	97	14	50	8	41	32.8
3	59	29.0	96	56	35	8	41	32.9
4	00	12.8	96	39	50	8	41	33.2
4	01	10.7	96	17	25	8	41	33.1
4	02	24.0	95	49	30	8	41	34.2
4	03	13.3	95	30	05	8	41	33.2
4	03	52.0	95	15	10	8	41	33.2
4	04	46.9	94	54	10	8	41	33.7
4	05	25.5	94	39	10	8	41	33.4
4	06	18.0	94	18	30	8	41	32.4

Thermometer 50°.

Mean of 20 observations, 8*h*. 41*m*. 54.75*s*.

APPENDIX No. 5—Continued.

October 31, 1846.—*Camp* 87.

DETERMINATION OF LONGITUDE.

, p. m.		Distance of *a* Aquilæ from moon's western limb.			Double altitudes of moon's upper limb.		
.	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	54.2	70	52	15	99	35	55
1	02.5	70	58	40	100	17	30
4	36.0	70	59	40	101	26	10
5	37.3	71	00	55	102	03	30
0	35.8	71	01	20	103	18	40
2	14.0	71	01	30	103	48	00
4	25 0	71	02	00	104	28	15
8	19.6	71	04	05	105	38	50
0	07 8	71	04	30	106	10	20
1	38.0	71	05	40	106	37	40
5	08.5	71	06	20	107	03	10
6	00.0	71	07	20	107	53	00
7	57.0	71	08	10	108	26	30

Thermometer 43°.

e, p. m.		Distance of Aldebaran from moon's western limb.			Double altitudes of the moon's upper limb.		
.	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
7	49.0	59	10	20	113	39	20
0	59.6	59	09	40	114	24	40
4	43.8	59	08	25	115	16	50
6	19.5	59	07	45	115	38	20
8	07.8	59	07	05	116	02	30
9	39.4	59	06	20	116	22	10
2	01.8	59	05	35	116	51	55
3	33.5	59	04	45	117	11	00
5	08.8	59	04	05	117	30	10

Thermometer 40°.

	h.	*m.*	*s.*
e by west star............................	7	23	15.07
e by east star............................		20	18.09
Mean....................................	7	21	47.30

APPENDIX No. 5—Continued.

October 31, 1846.—*Camp* 87.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	52	35.2	69	22	35	34	14	28
5	53	26.0	69	22	55	34	14	32
5	54	28.2	69	23	30	34	14	42
5	55	36.5	69	23	40	34	14	39
5	56	21.0	69	23	55	34	14	41
5	57	06.8	69	24	05	34	14	39
5	57	42.8	69	24	10	34	14	38
5	58	24.5	69	24	20	34	14	39
5	59	16.2	69	24	30	34	14	36
6	00	01.3	69	24	40	34	14	36
6	00	33.0	69	24	55	34	14	40

Thermometer 39°.

Mean of 11 observations, 33° 14′ 37″.

FOR INDEX ERROR.

	Min.	*sec.*
On the arc..............................	31	55
Off the arc..............................	31	30

APPENDIX No. 5—Continued.

November 2, 1846.—Camp 89, Disappointment creek.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæa in the east.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
3	20	05.0	113	10	50	8	42	04.9	
3	20	50.8	113	31	10	8	42	01.4	rej.
3	21	40.3	113	51	05	8	42	05.3	
3	22	45.0	114	17	20	8	42	05.5	
3	23	44.0	114	43	10	8	42	02.7	
3	24	29.5	115	01	30	8	42	04.4	
3	25	13.0	115	20	05	8	42	03.5	
3	26	03.8	115	41	15	8	42	03.8	
3	26	52.0	116	01	55	8	42	02.7	

Thermometer 40°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
3	28	38.4	106	06	10	8	42	09.9	rej.
3	30	25.0	105	22	35	8	42	04.6	
3	31	09.6	105	05	20	8	42	05.6	
3	31	53.0	104	49	00	8	42	06.1	
3	32	38.0	104	31	25	8	42	06.9	
3	33	18.0	104	15	35	8	42	06.3	
3	34	05.3	103	57	10	8	42	06.1	
3	34	50.2	103	39	50	8	42	07.8	
3	35	35.5	103	22	10	8	42	05.5	

Thermometer 40°.

Mean of 16 observations, 8*h*. 42*m*. 04.96*s*.

APPENDIX No. 5—Continued.

November 2, 1846.—*Camp* 89.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	39	40.8	68	27	40	33	14	57
3	40	47.6	68	28	05	33	14	49
3	41	48.5	68	28	45	33	14	50
3	42	29.0	68	29	10	33	14	50
3	43	31.6	68	29	45	33	14	48
3	44	13.7	68	30	20	33	14	54
3	45	06.9	68	31	10	33	14	02
3	46	03.5	68	31	20	33	14	53
3	46	57.1	68	31	55	33	14	54
3	47	43.5	68	32	20	33	14	53
3	48	55.8	68	32	55	33	14	57
3	49	13.0	68	33	20	33	14	57

Thermometer 40°.

Mean of 13 observations, 33° 14′ 54″

APPENDIX No. 5—Continued.

November 5, 1846.—Camp 91, on the San Pedro.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquarii near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
2	58	31.0	101	33	45	32	57	15
2	59	48.8	101	34	55	32	57	28
3	01	16.1	101	35	50	32	57	35
3	02	57.5	101	36	50	32	57	31
3	04	17.6	101	37	40	32	57	25
3	05	24.8	101	38	00	32	57	19
3	07	06.4	101	37	30	32	57	29
3	07	51.5	101	36	55	32	57	39
3	10	02.8	101	36	30	32	57	14
3	10	42.8	101	35	45	32	57	19
3	11	30.7	101	35	20	32	57	11
3	12	34.0	101	34	10	32	57	11
3	13	30.6	101	32	30	32	57	26

Thermometer 52°.

Mean of 13 observations, 32° 57′ 23″.

APPENDIX No. 5—Continued.

November 5, 1846.—*Camp No.* 91, *on the San Pedro.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	18	27.5	117	33	45	8	41	45.6
3	19	29.2	118	00	30	8	41	42.8
3	20	29.5	118	25	40	8	41	44.2
3	21	30.8	118	51	30	8	41	44.1
3	22	17.5	119	10	50	8	41	44.8
3	23	24.0	119	39	10	8	41	43.9
3	24	24.0	120	04	30	8	41	43.7
3	25	38.8	120	35	40	8	41	44.4
3	26	43.0	121	03	05	8	41	43.4

Thermometer 52°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	29	32.5	100	48	35	8	41	48.4
3	20	32.8	100	24	30	8	41	46.6
3	31	46.0	99	57	05	8	41	49.1
3	32	43.8	99	33	45	8	41	46.8
3	33	33.0	99	14	15	8	41	45.8
3	34	30.8	98	52	25	8	41	47.1
3	35	25.7	98	31	35	8	41	48.4
3	36	14.8	98	12	10	8	41	47.5
3	37	11.8	97	50	05	8	41	47.3

Thermometer 52°.

Mean of 18 observations, 8*h*. 41*m*. 45.76*s*.

APPENDIX No. 5—Continued.

November 5, 1846.—*Camp* 91, *on the San Pedro, about* ——— *from its mouth at the Gila.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	40	39.0	68	01	30	32	57	54
3	41	55.5	68	02	30	32	58	03
3	43	23.6	68	03	00	32	57	55
3	44	11.5	68	04	00	32	58	07
3	45	23.8	68	04	20	32	58	07
3	46	39.8	68	05	15	32	58	04
3	47	26.0	68	05	55	32	58	04
3	48	12.8	69	06	20	32	58	09
3	49	22.8	68	06	45	32	57	59
3	50	37.6	68	07	30	32	58	03
3	51	16.0	68	07	30	32	58	03
3	51	54.7	68	08	10	32	58	03

Thermometer 52°.

Mean of 12 observations, 32° 58′ 03″.

APPENDIX No. 5—Continued.

November 5, 1846.—*Camp* 91, *on the San Pedro.*

DETERMINATION OF LONGITUEE.

Time, p. m.			Distance of *a* Arietis from moon's eastern limb.			Double altitudes of moon's upper limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
12	29	20.0	48	22	30	134	00	30
12	31	01.5	48	22	40	133	26	20
12	32	40.8	48	22	55	132	50	10
12	34	14.2	49	23	40	132	17	35
12	36	29.0	48	23	40	131	30	30
12	38	25.5	48	23	55	130	48	30
12	40	22.6	48	25	40	130	05	30
12	42	09.5	48	26	30	129	27	00
12	43	37.8	48	26	50	128	54	10
12	44	51.5	48	27	10	128	28	10
12	47	31.2	48	27	40	127	29	30
12	49	26.8	48	28	15	126	45	50

Thermometer 32°.

APPENDIX No. 5—Continued.

November 5, 1846.—*Camp* 91, *on the San Pedro.*

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of Regulus from moon's eastern limb.			Double altitudes of moon's upper limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
12	57	55.2	65	18	45	123	36	00
12	59	49.5	65	18	00	122	52	15
13	01	38.0	65	17	20	122	11	15
13	05	13.8	65	16	35	121	34	40
13	04	47.5	65	16	00	120	59	30
13	06	04.5	65	15	30	120	29	50
13	07	57.8	65	14	55	119	46	40
13	09	15.0	65	14	30	119	16	20
13	10	51.5	65	13	55	118	49	00

Thermometer 32°.

Longitude, by mean of observations, 7*h.* 23*m.* 46.9*s.*

APPENDIX No. 5—Continued.

November 6, 1846.—Camp 91, on the San Pedro.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	12	38.0	116	51	40	8	41	32.2
3	13	45.8	117	20	15	8	41	32.0
3	14	31.0	117	40	00	8	41	30.5
3	15	26.0	118	02	45	8	41	31.1
3	16	19.7	118	24	50	8	41	32.3
3	17	17.6	118	50	05	8	41	30.1
3	18	12.8	119	12	25	8	41	32.2
3	18	59.8	119	33	15	8	41	29.6

Thermometer 64°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	22	56.5	101	45	35	8	41	35.1
3	23	53.8	101	21	55	8	41	31.5 rej.
3	24	44.8	101	03	15	8	41	34.4
3	25	22.5	100	49	05	8	41	35.6
3	26	11.2	100	29	50	8	41	34.6
3	27	07.5	100	08	15	8	41	35.3
3	28	00.5	99	47	45	8	41	35.6
3	28	55.8	99	25	50	8	41	34.3

Thermometer 64°.

APPENDIX No. 5—Continued.

November 6, 1846.—*Camp* 91, *on the San Pedro.*

DETERMINATION OF LONGITUDE.

Time.			Distance of Aldebaran from moon's western limb.			Double altitudes of moon's upper limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
7	43	11.0	25	53	55	65	27	10
7	44	45.2	25	54	25	66	06	20
7	47	03.8	25	55	35	67	03	10
7	49	18.0	25	56	15	67	58	10
7	51	03.0	25	57	15	68	40	50

Thermometer 42°.

Immersion of Jupiter's satellite, 6*h*. 42*m*. 40*s*.

APPENDIX No. 5—Continued.

November 8, 1846.—*Camp* 93, *on the Gila.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquarii near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
2	49	26.8	101	19	40	33	05	18
2	50	27.5	101	20	15	33	05	25
2	51	29.0	101	20	50	33	05	28
2	52	28.7	101	21	20	33	05	27
2	53	22.9	101	21	35	33	05	27
2	54	37.6	101	21	40	33	05	30
2	56	03.5	101	22	00	33	05	16
2	56	56.0	101	21	40	33	05	18
2	57	44.2	101	21	00	33	05	27
2	59	11.0	101	20	30	33	05	14
3	00	19.9	101	19	20	33	05	20

Thermometer 44°.

Mean of 12 observations, 33° 05′ 24″.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	30	26.0	68	17	40	33	05	48
3	31	20.0	68	18	10	33	05	48
3	32	32.5	68	18	40	33	05	43
3	33	38.5	68	19	45	33	05	58
3	34	29.0	68	20	10	33	05	55
3	35	07.2	68	20	45	33	06	02
3	35	47.0	68	21	20	33	06	09
3	36	28.8	68	21	45	33	06	09
3	37	18.0	68	23	15	33	06	01

Thermometer 42°.

Mean of 9 observations, 33° 05′ 57″.

APPENDIX No. 5—Continued.

November 8, 1846.—*Camp* 93, *on the Gila.*

DETERMINATION OF TIME.

Time p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	05	32.0	116	43	10	8	42	39.2
3	06	26.8	117	05	45	8	42	40.3
3	07	27.6	117	32	40	8	42	37.0
3	08	33.5	117	59	15	8	42	39.5
3	09	30.0	118	23	40	8	42	37.9
3	10	22.3	118	45	20	8	42	39.5
3	11	13.8	119	06	55	8	42	38.6
3	12	24.6	119	36	50	8	42	38.2

Thermometer 42°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	15	31.0	102	07	10	8	42	41.6
3	16	29.5	101	44	40	8	42	42.2
3	17	19.0	101	25	55	8	42	43.5
3	18	21.5	101	01	35	8	42	43.2
3	19	10.8	100	42	55	8	42	44.4
3	20	02.8	100	21	40	8	42	41.6
3	20	46.8	100	04	45	8	42	42.0
3	21	42.2	99	43	15	8	42	41.9

Thermometer 42°.

Mean of 16 observations, 8*h.* 42*m.* 40.66*s.*

APPENDIX No. 5—Continued.

November 10, 1846.—*Camp* 95, *near the Gila.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	51	20.2	113	20	05	8	44	24.1
2	52	11.5	113	41	35	8	44	23.3
2	53	21.0	114	10	30	8	44	24.0
2	54	10.8	114	30	50	8	44	25.3
2	55	03.8	114	53	05	8	44	23.3
2	56	05.0	115	19	25	8	44	23.9
2	56	59.6	115	42	15	8	44	24.0
2	57	52.1	116	04	35	8	44	25.3

Thermometer 52°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	03	15.5	104	30	25	8	44	29.5
3	04	18.0	104	05	30	8	44	27.7
3	05	07.8	103	46	10	8	44	27.9
3	06	01.1	103	25	40	8	44	28.5
3	06	47.8	103	07	35	8	44	28.6
3	07	30.8	102	51	20	8	44	29.8
3	08	13.5	102	34	10	8	44	28.4
3	09	00.5	102	15	45	8	44	29.1
3	09	47.8	101	57	50	8	44	29.3

Thermometer 52°.

Mean of 18 observations, 8*h.* 44*m.* 26.52*s.*

APPENDIX No. 5—Continued.

November 10, 1846.—*Camp* 95.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	27	02.0	68	16	25	33	04	25
3	27	55.8	68	16	45	33	04	20
3	28	50.0	68	17	20	33	04	22
3	29	41.8	68	17	55	33	04	26
3	30	30.0	68	18	15	33	04	22
3	31	14.5	68	18	30	33	04	17
3	31	52.5	68	18	55	33	04	20
3	32	23.8	68	19	10	33	04	17
3	33	08.5	68	19	40	33	04	21
3	34	00.5	68	19	55	33	04	14
3	34	44.0	68	21	00	33	04	34 rej.
3	35	44.5	68	21	00	33	04	18
3	36	25.8	68	21	30	33	04	27

Thermometer 50°.

Mean of 12 observations, 33° 04′ 21″.

APPENDIX No. 5—Continued.

November 12, 1846—*Camp* 97, *below Pimos village, about four mile from the Gila.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *b* Aquarii near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
2	35	15.0	101	09	45	33	09	32
2	37	17.0	101	12	20	33	09	10
2	38	28.5	101	12	45	33	09	22
2	39	53.8	101	13	05	33	09	29
2	40	55.8	101	13	40	33	09	20
2	41	50.3	101	14	05	33	09	09
2	43	05.5	101	13	25	33	09	25
2	43	40.0	101	12	50	33	09	37 rej
2	44	29.8	101	13	10	33	09	18
2	45	18.0	101	12	45	33	09	17
2	46	12.0	101	12	00	33	09	22
2	47	07.5	101	11	20	33	09	19
2	48	25.0	101	10	25	33	09	07
2	49	41.5	101	08	25	33	09	19

Thermometer 50°.

Mean of 13 observations, 33° 09′ 19″

APPENDIX No. 5—Continued.

November 13, 1846.—*Camp* 97.

DETERMINATION OF LONGITUDE.

Time, a. m.			Distance between sun's and moon's nearest limbs.			Double altitude of moon's lower limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	16	46.8	60	36	45			
4	18	10.0	60	36	25			
4	20	59.5	60	36	05			
4	23	05.2	60	35	30	114	18	15
4	24	45.8	60	35	00	114	20	50
4	26	17.0	60	34	20	114	22	25
4	28	09.2	60	34	25	114	23	30
4	31	26.5	60	33	05	114	25	00
4	33	00.0	60	32	50	114	24	50
4	34	47.3	60	32	45	114	23	40
4	36	04.8	60	32	05	114	22	10
4	38	25.0	60	31	25	114	19	30
4	40	07.6	60	31	05	114	16	10
4	41	26.5	60	30	30	114	13	50

Thermometer 54°.

INDEX ERROR.

On the arc................................	31.55″
Off the arc................................	32.25

APPENDIX No. 5—Continued.

November 12, 1846.—*Camp* 97.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	55	19.8	117	53	15	8	45	23.8
2	56	27.2	118	21	15	8	45	25.2
2	57	31.0	118	48	20	8	45	24.5
2	58	17.0	119	07	10	8	45	25.7
2	59	04.7	119	27	40	8	45	22.5
2	59	48.5	119	46	15	8	45	23.9
3	00	32.8	120	04	55	8	45	23.8
3	01	29.2	120	29	15	8	45	22.1
3	02	16.8	120	48	25	8	45	24.1
3	03	05.0	121	08	38	8	45	24.2

Thermometer 50°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	07	26.8	100	15	40	8	45	26.9
3	08	11.2	99	59	05	8	45	28.5
3	09	19.8	99	31	50	8	45	27.9
3	10	05.5	99	14	15	8	45	27.2
3	11	03.8	98	51	45	8	45	27.3
3	11	45.5	98	35	45	8	45	27.9
3	12	50.0	98	10	55	8	45	28 2
3	13	47.2	97	48	40	8	45	27.9
3	14	35.5	97	29	50	8	45	27.5
3	15	24.8	97	10	30	8	45	26.8
3	16	19.8	96	49	10	8	45	26.7
3	17	05.0	96	31	25	8	45	26.0

Thermometer 50°.

Mean of 22 observations, 8*h*. 45*m*. 25.79*s*.

APPENDIX No. 5—Continued.

November 12, 1846.—*Camp* 97.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	28	58.5	68	31	50	33	09	40
3	29	52.5	68	32	20	33	09	41
3	30	46.0	68	32	50	33	09	41
3	31	51.8	68	33	05	33	09	31
3	33	16.0	68	34	00	33	09	35
3	34	05.0	68	34	35	33	09	40
3	35	03.8	68	34	55	33	09	33
3	36	07.0	68	35	40	33	09	38
3	37	04.0	68	36	05	33	09	35
3	37	41.8	68	36	45	33	09	43
3	38	34.2	68	37	00	33	09	58
3	39	11.5	68	37	35	33	09	31

Thermometer 48°.

Mean of 12 observations, 33° 09′ 37″.

APPENDIX No. 5—Continued.

November 13, 1846.—*Camp* 97.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of sun's upper limb.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
5	41	04.8	50	23	10	8	45	18.9
5	42	28.7	50	47	35	8	45	19.7
5	42	59.0	50	57	15	8	45	17.2
5	43	40.0	51	08	50	8	45	18.5
5	44	34.0	51	24	55	8	45	17.3
5	45	38.5	51	43	20	8	45	18.6
5	46	35.8	52	00	10	8	45	17.7
5	47	05.8	52	09	00	8	45	17.2
5	47	42.5	52	18	28	8	45	21.0 rej.
5	48	38.0	52	35	15	8	45	17.8
5	49	22.5	52	48	05	8	45	17.7
5	50	14.5	53	02	35	8	45	18.8

Thermometer 60°.

Mean of 11 observations, 8*h*. 45*m*. 18.13*s*.

APPENDIX No. 5—Continued.

November 14, 1846.—*Camp* 99, *on the Gila.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	42	53.0	114	56	50	8	47	49.3
2	43	54.6	115	22	45	8	47	49.2
2	44	54.2	115	47	50	8	47	51.2
2	45	57.5	116	13	45	8	47	50.7
2	46	48.0	116	35	35	8	47	49.2
2	47	47.0	117	00	10	8	47	47.6
2	48	32.0	117	19	00	8	47	50.1
2	49	21.5	117	40	05	8	47	49.5

Thermometer 50°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	17	07.0	94	16	50	8	47	54.0
3	17	55.8	93	58	10	8	47	52.9
3	18	44.0	93	39	40	8	47	53.2
3	19	38.8	93	19	10	8	47	54.8
3	20	37.0	92	55	20	8	47	51.3
3	22	02.8	92	21	15	8	47	48.5 rej.
3	22	52.8	92	03	10	8	47	51.7
3	23	37.0	91	46	20	8	47	52.2

Thermometer 50°.

Mean of 15 observations, 8*h*. 47*m*. 51.23*s*.

APPENDIX No. 5—Continued.

November 14, 1846.—*Camp* 99, *on the Gila.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Saturn near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
2	52	36.2	84	14	10	32	59	17
2	53	33.0	84	15	40	32	59	07
2	54	23.5	84	16	30	32	59	10
2	55	06.8	84	17	05	32	59	13
2	56	52.5	84	18	30	32	59	14
2	58	08.2	84	19	55	32	58	53
2	59	15.5	84	20	05	32	59	03
3	00	25.8	84	20	50	32	58	50
3	01	51.5	84	20	30	32	59	03
3	02	48.0	84	20	10	32	59	10
3	03	50.0	84	19	55	32	59	10
3	04	54.8	84	19	15	32	59	17
3	06	04.8	84	18	35	32	59	21
3	07	19.2	84	17	45	32	59	16
3	08	26.8	84	17	10	32	59	04
3	09	22.8	84	15	40	32	59	20
3	10	10.8	84	14	40	32	59	22

Thermometer 50°.

Mean of 17 observations, 32° 59′ 10″.

APPENDIX No. 5—Continued.

November 14, 1846 —*Camp* 99, *on the Gila*.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	28	14.8	68	14	20	32	59	36
3	29	28.5	68	14	35	32	59	25
3	30	27.0	68	15	15	32	59	29
3	32	19.0	68	16	00	32	59	20
3	33	36.8	68	17	05	32	59	34
3	35	02.5	68	18	05	32	59	40
3	36	06.9	68	18	25	32	59	34
3	37	08.5	68	19	05	32	59	39
3	38	04.6	68	19	45	32	59	35

Thermometer 50°.

Mean of 9 observations, 32° 59′ 34″.

APPENDIX No. 5—Continued.

November 15, 1846.—*Camp* 99.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Andromedæ in the east.			Chronometer fast.		
h	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	41	43.6	116	12	05	8	47	36.7
2	42	41.7	116	35	50	8	47	38.3
2	43	22.5	116	53	20	8	47	37.5
2	43	59.8	117	08	20	8	47	38.8
2	44	35.0	117	23	45	8	47	37.6
2	45	28.0	117	46	20	8	47	36.9
2	46	14.8	118	05	40	8	47	37.6
2	46	56.0	118	23	10	8	47	37.2

Thermometer °.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	48	47.8	103	38	55	8	47	40.1
2	49	42.0	103	18	35	8	47	41.2
2	50	23.0	103	02	05	8	47	40.6
2	51	06.8	102	44	10	8	47	57.5 rej.
2	51	50.0	102	28	40	8	47	40.8
2	52	38.5	102	08	50	8	47	38.2
2	53	19.0	101	53	55	8	47	40.4
2	54	15.2	101	32	05	8	47	40.4

Mean of 15 observations, 8*h.* 47*m.* 38.71*s.*

APPENDIX No. 5—Continued.

November 14, 1846.—*Camp* 101, *on the Gila.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Algerib in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	14	02.8	116	17	50	8	49	33.0
3	15	00.0	116	38	55	8	49	32.9
3	16	12.5	117	05	45	8	49	32.3
3	17	12.5	117	26	55	8	49	34.2
3	18	08.0	117	47	30	8	49	33.2
3	19	02.5	118	07	35	8	49	32.4
3	19	55.3	118	26	45	8	49	32.4
3	20	42.2	118	43	25	8	49	33.1
3	21	52.8	119	09	15	8	49	31.9

Thermometer 40°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
3	24	29.8	87	31	20	8	49	37.1	
3	25	16.8	87	13	20	8	49	37.2	
3	26	03.5	86	55	10	8	49	36.6	
3	26	57.8	86	34	10	8	49	36.0	
3	28	02.0	86	08	45	8	49	33.9	rej.
3	28	52.6	85	49	55	8	49	35.4	
3	29	55.3	85	26	20	8	49	38.3	
3	30	35.5	85	10	50	8	49	36.1	
3	31	14.0	84	56	20	8	49	37.1	

Thermometer 40°.

Mean of 17 observations, 8*h.* 49*m.* 34.76*s.*

APPENDIX No. 5—Continued.

November 17, 1846.—*Camp* 101.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	51	28.5	68	22	55	32	55	40
3	52	32.8	68	23	20	32	55	38
3	53	52.3	68	24	05	32	55	43
3	54	46.0	68	25	10	32	56	05
3	56	07.0	68	25	00	32	55	41
3	57	42.8	68	25	50	32	55	46
3	58	50.5	68	26	25	32	55	48
3	59	35.0	68	27	00	32	55	58
4	00	13.5	68	27	25	32	56	00
4	00	52.8	68	27	45	32	56	02
4	01	28.0	68	28	05	32	56	04
4	02	20.0	68	28	20	32	56	00

Thermometer 38°.

Mean of 12 observations, 32° 55′ 52″

APPENDIX No. 5—Continued.

November 19, 1846.—*Camp* 103, *on an island of the Gila.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	40	47.5	78	47	20	8	51	21.6
3	41	34.8	78	29	00	8	51	20.7
3	42	21.0	78	10	45	8	51	18.7
3	43	12.0	77	51	05	8	51	17.9
3	44	16.5	77	26	55	8	51	18.8
3	45	04.3	77	09	10	8	51	19.7
3	45	48.2	76	52	35	8	51	19.9
3	46	34.8	76	34	55	8	51	19.9
3	47	26.5	76	15	10	8	51	19.4

Thermometer 50°.

Time. p. m.			Double altitudes of *a* Arietis in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	53	19.0	97	50	55	8	51	17.1
3	54	11.2	98	13	10	8	51	16.5
3	54	57.8	98	32	00	8	51	18.4
3	55	39.8	98	50	05	8	51	17.4
3	56	32.0	99	12	20	8	51	16.8
3	57	21.0	99	33	10	8	51	16.3
3	58	40.0	100	05	45	8	51	18.0
3	59	30.8	100	27	45	8	51	16.4
4	00	11.0	100	44	45	8	51	16.4
4	00	51.2	101	01	35	8	51	16.5

Thermometer 50°.

Mean of 19 observations, 8*h*. 51*m*. 18.30*s*.

APPENDIX No. 5—Continued.

November 19, 1846.—*Camp* 103.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	08	37.0	68	09	05	32	43	55
4	09	32.5	68	10	00	32	44	13
4	10	37.8	68	10	00	32	44	01
4	11	06.5	68	10	25	32	44	08
4	12	42.0	68	10	50	32	44	02
4	13	27.2	68	11	00	32	43	59
4	14	10.8	68	11	25	32	44	03
4	14	32.0	68	11	50	32	44	09
4	15	57.0	68	12	20	32	44	12
4	16	46.0	68	12	50	32	44	18
4	17	56.5	68	12	55	32	44	09
4	19	33.0	68	13	10	32	44	00
4	20	40.5	68	13	25	32	43	55

Thermometer 46°.

Mean of 13 observations, 32° 44′ 05″.

APPENDIX No. 5—Continued.

November 19, 1846.—*Camp* 103.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Procyon near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
12	16	18.0	125	34	55	32	43	40
12	17	58.8	125	39	55	32	43	00
12	20	46.8	125	43	15	32	43	37
12	23	26.2	125	46	15	32	43	27
12	25	00.5	125	48	00	32	42	58
12	27	09.0	125	48	10	32	42	55
12	29	42.0	125	46	30	32	43	04
12	31	34.0	125	42	35	32	44	02
12	33	49.8	125	41	50	32	42	39
12	34	47.7	125	39	05	32	43	06
12	36	54.5	125	35	40	32	42	21

Thermometer 28°.

Mean of 11 observations, 32° 43′ 11″.

APPENDIX No. 5—Continued.

November 21, 1846.—*Camp* 105, *on the Gila.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	21	02.0	83	44	15	8	52	28.0
3	21	49.2	83	25	35	8	52	26.4
3	22	43.9	83	05	10	8	52	27.6
3	23	27.8	82	48	25	8	52	27.6
3	24	17.2	82	29	55	8	52	28.6
3	25	12.0	82	08	35	8	52	27.7
3	25	55.5	81	52	15	8	52	28.2
3	27	16.0	81	20	20	8	52	15.0 rej.
3	27	55.9	81	06	05	8	52	27.6

Thermometer 40°.

Time, p. m.			Double altitudes of *a* Arietis in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	32	43.3	92	00	30	8	52	25.9 rej.
3	33	36.0	92	24	00	8	52	21.9
3	34	32.0	92	47	10	8	52	22.8
3	35	40.8	93	16	10	8	52	23.0
3	36	27.6	93	35	45	8	52	23.3
3	37	16.8	93	57	15	8	52	21.4
3	38	19.5	94	23	45	8	52	21.3
3	39	15.5	94	47	30	8	52	20.9
3	40	15.0	95	12	40	8	52	21.8

Thermometer 40°.

Mean of 16 observations, 8*h*. 52*m*. 24.88*s*.

APPENDIX No. 5—Continued.

November 21, 1846.—*Camp* 105.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	45	29.0	68	00	30	32	42	58 rej.
3	46	38.8	68	01	40	32	43	17
3	47	23.8	68	01	50	32	43	13
3	48	20.7	68	02	10	32	43	10
3	49	03.1	68	02	30	32	43	12
3	49	46.8	68	03	05	32	43	19
3	50	24.2	68	03	25	32	43	22
3	50	58.0	68	03	50	32	43	27
3	51	49.5	68	04	00	32	43	22
3	52	25.0	68	04	10	32	43	20
3	53	04.9	68	04	20	32	43	16
3	53	46.8	68	04	30	32	43	13
3	54	23.5	68	04	45	32	43	13

Thermometer 40°.

Mean of 12 observations, 32° 43′ 17″.

APPENDIX No. 5—Continued.

November 22, 1846.—*Camp* 106, *near the mouth of the Gila*, 5, *p. m.*

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of Fomalhaut from moon's western limb.			Double altitudes of moon's lower limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
2	41	39.0	46	52	15	58	40	50
2	44	10.8	46	51	40	58	01	20
2	46	53.8	46	50	20	57	18	30
2	49	15.0	46	49	45	56	41	10
2	52	36.2	46	48	45	55	46	20
2	56	17.5	46	47	30	54	46	10
3	02	06.0	46	45	35	53	08	55
3	03	49.2	46	45	10	52	49	50
3	06	13.8	46	44	40	51	58	50

Thermometer 60°.

Longitude, by mean of observations, 7*h*. 40*m*. 50.00*s*

APPENDIX No. 5—Continued.

November 22, 1846.—Camp 106, near the mouth of the Gila.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	14	13.3	85	09	35	8	53	20.9
3	15	17.7	84	44	55	8	53	20.9
3	16	17.6	84	21	35	8	53	19.8
3	17	13.8	83	59	30	8	53	18.3
3	18	05.9	83	40	10	8	53	19.8
3	18	54.0	83	21	40	8	53	19.5
3	19	53.0	82	59	00	8	53	19.2
3	20	44.8	82	40	05	8	53	21.5
3	21	35.2	82	20	15	8	53	20.0

Thermometer 60°.

Time, p. m.			Double altitudes of *a* Arietis in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	28	17.5	91	26	10	8	53	16.7
3	29	06.0	91	47	40	8	53	14.2
3	29	58.8	92	09	40	8	53	16.0
3	30	49.8	92	30	20	8	53	16.8
3	31	33.5	92	49	30	8	53	15.0
3	32	28.0	93	11	25	8	53	18.6
3	33	33.8	93	40	10	8	53	15.2
3	34	55.0	94	14	15	8	53	15.5
3	35	54.8	94	39	15	8	53	18.0

Thermometer 60°.

Mean of 18 observations, 8*h*. 53*m*. 18.10*s*.

APPENDIX No. 5—Continued.

November 22, 1846.—*Camp* 106.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	48	19.5	68	01	50	32	42	21
3	49	26.0	68	02	15	32	42	19
3	59	18.0	68	02	30	32	42	18
3	59	59.8	68	02	25	32	42	08
3	52	56.0	68	03	30	32	42	15
3	54	08.0	68	04	10	32	42	15
3	55	12.8	68	04	20	32	42	14
3	56	07.8	68	05	05	32	42	25
3	57	10.9	68	05	20	32	42	22
3	58	23.2	68	05	35	32	42	14
3	59	26.8	68	05	45	32	42	08
4	00	35.2	68	06	05	32	42	05
4	01	51.8	68	06	45	32	42	11

Thermometer 60°.

Mean of 13 observations, 32° 42′ 15″.

APPENDIX No. 5—Continued.

November 23, 1846.—*Camp* 106.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Saturn in the west.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
2	39	36.5	85	06	00
2	40	38.5	85	04	50
2	41	37.0	85	03	20
2	42	42.8	85	02	50
2	43	20.0	85	01	10
2	44	01.0	85	00	00

Thermometer 56°.

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of *a* Arietis from moon's western limb.			Double altitudes of moon's lower limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	15	51.0	88	30	55	68	50	20
3	20	08.8	88	28	10	67	47	20
3	22	08.5	88	27	20	67	17	45
3	28	06.0	88	24	45	65	46	50
3	30	41.5	88	23	50	65	06	55
3	31	08.5	88	22	30	64	11	50
3	35	54.8	88	21	40	63	44	00

Thermometer 56°.

	h.	*m.*	*s.*
Longitude by *a* Arietis............................	7	39	46.5
Longitude by Fomalhaut	7	40	50.0
Mean	7	40	18.25

APPENDIX No. 5—Continued.

November 25, 1846.—*Camp* 106.

Time, p. m.			Double altitudes of *a* Arietis in the east.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
3	42	58.8	99	22	55	8	53	02.9	
3	43	56.0	99	46	25	8	53	04.5	
3	44	37.8	100	02	45	8	53	07.4	rej.
3	45	31.8	100	26	20	8	53	05.3	
3	46	22.0	100	48	10	8	53	03.7	
3	47	10.8	101	08	35	8	53	03.9	
3	47	59.0	101	28	65	8	53	03.5	
4	48	55.5	101	52	25	8	53	04.6	
4	49	39.0	102	11	20	8	53	03.1	

Thermometer 54°.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	54	46.8	68	12	40	8	53	05.1
3	55	48.0	67	49	40	8	53	04.9
3	56	36.5	67	32	15	8	53	06.8
3	57	18.3	67	16	40	8	53	06.8
3	58	08.8	66	57	50	8	53	06.8
3	58	53.8	66	40	25	8	53	05.1
3	59	32.8	66	26	20	8	53	06.3
4	00	20.8	66	08	10	8	53	03.5
4	01	04.0	65	52	30	8	53	06.7

Thermometer 52°.

Mean of 17 observations, 8*h*. 53*m*. 04.86*s*.

APPENDIX No. 5—Continued.

November 23, 1846.—*Camp* 106.

Time, p. m.			Double altitudes of Sirius near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
11	14	39.8	81	34	55	32	42	06
11	15	36.0	81	35	20	32	42	11
11	16	30.7	81	36	10	32	41	59
11	17	33.6	81	36	20	32	42	05
11	18	36.8	81	36	40	32	42	01
11	19	33.0	81	36	30	32	42	23 rej.
11	21	17.5	81	36	20	32	42	06
11	22	17.0	81	36	20	32	41	57
11	23	06.0	81	35	45	32	42	04
11	23	54.8	81	35	10	32	42	07
11	24	40.0	81	34	45	32	42	05
11	25	41.6	81	34	05	32	42	01
11	27	00.0	81	33	10	32	41	51

Thermometer 46°.

Mean of 12 observations, 32° 42′ 03″.

APPENDIX No. 5—Continued.

November 25, 1846.—Camp 108—first camp after leaving the Rio Colorado.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
3	05	57.5	84	00	20	8	53	63.1	rej.
3	06	40.8	83	44	15	8	53	59.2	
3	07	27.9	83	26	35	8	54	01.1	
3	08	16.5	83	07	45	8	53	59.5	
3	09	10.9	82	46	50	8	53	59.2	
3	09	59.8	82	28	35	8	53	60.4	
3	10	48.0	82	09	30	8	53	58.7	
3	11	34.8	81	51	35	8	53	58.6	

Thermometer 46°.

Time, p. m.			Double altitudes of *a* Arietis in the east.			Chronometer fast.			
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
3	16	18.5	91	06	00	8	53	54.4	
3	17	14.0	91	31	25	8	53	49.8	rej.
3	17	52.5	91	45	15	8	53	55.6	
3	18	31.6	92	02	00	8	53	54.9	
3	19	15.0	92	20	55	8	53	53.4	
3	19	58.5	92	39	35	8	53	52.8	
3	20	39.5	92	56	30	8	53	53.8	
3	21	26.8	93	16	20	8	53	54.0	

Thermometer 46°.

Mean of 14 observations, 8*h.* 53*m.* 56.82*s*.

APPENDIX No. 5—Continued.

November 25, 1846.—*Camp* 108.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	24	40.5	67	52	05	32	40	11
3	25	46.2	67	52	55	32	40	22
3	26	45.0	67	53	10	32	40	16
3	27	31.8	67	53	30	32	40	16
3	28	51.5	67	54	20	32	40	24
3	29	44.0	67	54	40	32	40	22
3	30	26.8	67	55	05	32	40	25
3	31	06.5	67	55	45	32	40	23
3	32	01.0	67	55	45	32	40	24
3	33	25.0	67	56	30	32	40	30

Thermometer 44°.

Mean of 10 observations, 32° 40′ 22″.

APPENDIX No. 5—Continued.

November 28, 1846.—*Camp* 111.

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of Aldebaran from moon's western limb.			Double altitudes of moon's lower limb.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	27	34.0	49	25	25	129	01	40
5	29	22.8	49	24	45	129	05	50
5	31	16.0	49	23	55	129	08	25
5	33	17.5	49	23	05	129	11	10
5	05	15.8	49	22	35	129	12	20
5	37	22.8	49	21	50	129	13	00
5	39	25.8	49	21	15	129	12	40
5	41	25.8	49	20	25	129	11	10

Thermometer 44°.

Longitude, by mean of observations, 7*h.* 43*m.* 06.4*s.*

APPENDIX No. 5—Continued.

November 28, 1846.—*Camp* 111.

DETERMINATION OF LONGITUDE.

Time, p. m.			Distance of Fomalhaut from moon's western limb.			Double altitudes of moon's lower limb		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	48	54.0	50	32	50	128	57	30
5	51	03.8	50	33	30	128	50	20
5	53	43.7	50	34	10	128	40	30
5	58	03.5	50	35	35	128	22	15
6	01	58.0	50	36	10	128	00	00
6	05	24.1	50	37	50	127	38	30
6	08	12.5	50	39	00	127	19	20
6	10	19.2	50	39	00	127	03	20
6	15	10.0	50	40	30	126	40	10
6	16	02.7	50	41	20	126	15	30
6	19	19.0	50	42	40	125	45	50

Thermometer 44°.

	h.	*m.*	*s.*
Longitude by Fomalhaut	7	43	43.01
Longitude by Aldebaran		54	06.04
Mean	7	43	24.75

APPENDIX No. 5—Continued.

November 28.—Camp 111, Cariso creek, first after passing the Jornada.

DETERMINATION OF TIME.

Time, p. m.	Double altitudes of *a* Lyræ in the west.	Chronometer fast.
h. m. s.	*Deg. min. sec.*	*h. m. s.*
2 49 25.5	87 31 40	8 57 58.4
2 50 20.0	87 10 40	8 57 57.2
2 51 10.0	86 51 20	8 57 56.8
2 51 54.5	86 31 45	8 57 37.9
2 52 43.0	86 15 30	8 57 56.4
2 53 23.3	86 00 20	8 57 57.0
2 54 18.2	85 39 35	8 57 57.7
2 55 07.3	85 19 50	8 57 55.2
2 55 51.5	85 03 35	8 57 55.0

Thermometer 48°.

Time, p. m.	Double altitudes of *a* Arietis in the east.	Chronometer fast.
h. m. s.	*Deg. min. sec.*	*h. m. s.*
3 02 01.8	88 21 15	8 57 56.7
3 03 06.2	88 47 45	8 57 58.2
3 03 59.8	89 10 05	8 57 58.8
3 04 55.5	89 33 45	8 57 58.2
3 05 55.8	89 59 45	8 57 56.7
3 06 47.8	90 21 10	8 57 57.8
3 07 47.5	90 46 30	8 57 57.3
3 08 32.8	91 05 25	8 57 57.7
3 09 21.5	91 27 35	8 57 53.7 rej.

Thermometer 48°.

Mean of 17 observations, 8*h*. 57*m*. 57.26*s*.

APPENDIX No. 5—Continued.

November 28, 1846.—*Camp* 111.

DETERMINATION OF LATITUDE

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	23	15.0	68	19	25	32	52	31
3	24	09.0	68	19	40	32	52	28
3	25	04.5	68	20	00	32	52	25
2	26	06.5	58	19	30	32	51	56 rej.
3	26	50.0	68	21	20	32	52	43
3	27	35.0	68	21	35	32	52	40
3	28	22.5	68	21	40	32	52	33
3	29	34.5	68	21	50	32	52	24
3	30	52.0	68	22	20	32	52	24
3	32	11.8	68	23	20	32	52	37
3	33	20.0	68	23	40	32	52	34
3	34	02.5	68	23	55	32	52	33
3	35	20.0	68	24	25	32	52	39

Thermometer 46°.

Mean of 12 observations, 32° 52′ 33″

APPENDIX No. 5—Continued.

November 29, 1846.—*Camp* 112, "*Valle Citon.*"

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	47	23.8	87	10	05	8	58	44.1
2	48	17.0	86	49	10	8	58	42.7
2	49	13.9	86	27	20	8	58	42.6
2	50	03.5	86	08	25	8	58	42.9
2	50	51.5	85	50	15	8	58	43.5
2	51	32.0	85	35	05	8	58	44.2
2	52	24.2	85	14	45	8	58	43.3
2	53	12.4	84	56	10	8	58	42.9

Thermometer 50°.

Time, p. m.			Double altitudes of *a* Arietis in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	58	01.0	87	59	50	8	58	43.7
2	58	50.3	88	21	20	8	58	41.9
2	59	30.0	88	37	35	8	58	42.9
3	00	19.2	88	58	30	8	58	42.4
3	01	20.3	89	23	55	8	58	42.9
3	02	16.5	89	48	35	8	58	40.5
3	03	10.8	90	10	35	8	58	42.4
3	04	12.0	90	36	40	8	58	41.8
3	05	04.2	90	58	35	8	58	41.7

Thermometer 50°.

Mean of 17 observations, 8*h.* 58*m.* 42.78*s.*

APPENDIX No. 5—Continued.

November 30, 1846.—*Camp* 112.

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	47	58.8	85	21	15	8	58	31.2
2	48	46.6	85	02	55	8	58	31.2
2	49	38.8	84	42	55	8	58	30.7
2	50	27.5	84	24	15	8	58	30.5
2	51	11.0	84	07	45	8	58	30.7
2	51	55.2	83	50	40	8	58	30.3
2	52	45.0	83	31	20	8	58	29.3
2	53	29.9	83	14	25	8	58	29.9
2	54	21.7	82	55	05	8	58	31.1

Thermometer 48°.

Time, p. m.			Double altitudes of *a* Arietis in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	14	21.0	96	37	20	8	58	28.1
3	16	50.8	97	40	10	8	58	27.6
3	17	25.0	97	54	10	8	58	29.1
3	19	40.6	98	50	50	8	58	29.9
3	22	24.8	99	59	55	8	58	29.5

Thermometer 48°.

Means of 14 observations, 8*h.* 58*m.* 29.69*s.*

Boisterous and cloudy. The ground at this camp is spongy, and shaken by the lightest tread.

APPENDIX No. 5—Continued.

November 29, 1846.—*Camp* 112.

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	08	45.0	68	26	20	32	58	24
3	09	51.8	68	26	40	32	58	24
3	10	47.5	68	27	30	32	58	32
3	12	02.0	68	27	45	32	58	20
3	13	02.5	68	27	55	32	58	13
3	13	52.5	68	28	15	32	58	10
3	14	33.5	68	28	35	32	58	12
3	15	26.0	68	28	55	32	58	10
3	16	04.0	68	29	10	32	58	09
3	16	40.8	68	29	20	32	58	02
3	17	27.0	68	29	55	32	58	14
3	18	06.2	68	30	00	32	58	08

Thermometer 50°.

Mean of 12 observations, 32° 58′ 15″

APPENDIX No. 5—Continued.

December 2, 1846.—*Camp* 114, " *Warner's.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	45	26.8	83	51	55	8	59	16.0
2	46	22.5	83	31	10	8	59	17.2
2	47	17.9	83	10	05	8	59	17.3
2	47	56.8	82	54	55	8	59	16.4
2	48	44.0	82	37	35	8	59	18.1
2	49	31.7	82	18	30	8	59	15.6
2	50	25.8	81	57	55	8	59	16.4
2	51	13.0	81	40	15	8	59	16.3
2	51	57.8	81	23	50	8	59	17.9

Thermometer 34°.

Time, p. m.			Double altitudes of *a* Arietis in the east.			Chronometer fast.		
h	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
2	58	40.8	92	59	40	8	59	15.6
2	59	32.3	93	20	50	8	59	16.6
3	00	24.0	93	42	35	8	59	16.4
3	01	19.5	94	06	55	8	59	13.7 rej.
3	02	12.5	94	28	30	8	59	15.2
3	03	31.2	95	00	55	8	59	16.6
3	04	19.3	95	21	05	8	59	16.5
3	05	16.8	95	44	50	8	59	17.2
3	06	58.5	96	03	20	8	59	14.8

Thermometer 36°.

Mean of 17 observations, 8*h*. 59*m*. 16.46*s*.

APPENDIX No. 5—Continued.

December 2, 1846.—*Camp* 114, "*Warner's*"

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	11	12.8	69	09	55	33	17	21
3	12	11.8	69	09	10	33	16	40
3	13	33.5	69	09	25	33	16	29
3	14	51.5	69	10	55	33	17	00
3	16	28.9	68	11	35	33	17	09
3	17	51.0	69	12	10	33	17	09
3	18	35.8	69	12	10	33	16	47
3	20	31.0	69	12	50	33	16	49
3	21	03.8	69	13	25	33	16	58
3	21	52.0	69	13	40	33	16	58
3	22	23.8	69	13	55	33	16	59
3	23	13.0	69	14	10	33	16	59

Thermometer 64°.

Mean of 12 observations, 33° 16′ 57″.

APPENDIX No. 5—Continued.

December 8, 1846.—*Camp* 118, *San Bernardo.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *a* Lyræ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h*	*m.*	*s.*
3	19	08.0	62	19	00	8	59	41.2
3	20	28.8	61	49	25	8	59	40.8
3	21	20.2	61	30	20	8	59	40.4
3	22	17.9	61	09	30	8	59	41.6
3	22	59.5	60	53	55	8	58	40.7
3	23	46.2	60	36	35	8	59	40.4
3	24	34.7	60	19	25	8	59	39.3
3	25	28.8	59	59	20	8	59	41.5
3	26	06.8	59	44	60	8	59	40.5

Thermometer 40°.

Time, p. m.			Double altitudes of *a* Arietis in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	34	46.0	117	46	30	8	59	36.9
3	35	41.8	118	09	15	8	59	37.5
3	36	32.8	118	30	15	8	59	37.6
3	37	13.8	118	47	35	8	59	36.5
3	38	13.8	119	12	35	8	59	35.8
3	38	59.6	119	30	30	8	59	38.1
3	39	40.0	119	47	25	8	59	37.5
3	40	34.7	120	09	30	8	59	38.5

Thermometer 40°.

Mean of 17 observations, 8*h*. 59*m*. 38.95*s*.

APPENDIX No. 5—Continued.

December 8, 1846.—*Camp* 118, *San Bernardo.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
3	44	15.0	69	01	30	33	03	49
3	45	10.0	69	01	50	33	03	45
3	45	45.5	69	02	00	33	03	46
3	46	32.2	69	02	00	33	03	40
3	47	10.8	69	02	10	33	03	41
3	48	00.8	69	02	30	33	03	45
3	48	34.6	69	02	40	33	03	46
3	49	25.8	69	02	35	33	03	38
3	50	04.0	69	02	30	33	03	32

Thermometer 40°.

Mean of 9 observations, 33° 03′ 42″.

APPENDIX No. 5—Continued.

December 16, 1846.—*Camp* 120, *San Diego.*

DETERMINATION OF TIME.

ne, p. m.		Double altitudes of *a* Arietis in the east.			Chronometer fast.		
n.	*s.*	*Deg*	*min.*	*sec.*	*h.*	*m.*	*s.*
3	31.0	129	04	15	8	58	38.1
4	24.0	129	25	25	8	58	39.1
5	15.8	129	46	10	8	58	39.2
6	26.8	130	15	40	8	58	36.9
7	30.0	130	41	20	8	58	36.4
8	23.2	131	02	10	8	58	37.8
9	23.9	131	26	40	8	58	37.4
0	22.5	131	50	20	8	58	36.9

Thermometer 50°

e, p. m.		Double altitudes of *a* Pegasi in the west.			Chronometer fast.			
	s.	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*	
2	26.5	123	38	45	8	58	41.6	
3	43.8	123	11	55	8	58	41.2	
4	42.8	122	50	55	8	58	42.0	
5	34.7	122	33	10	8	58	40.9	
6	25.0	122	16	45	8	58	44.2	rej.
7	22.3	121	55	40	8	58	41.6	
8	13.0	121	37	40	8	58	41.3	
9	04.5	121	19	40	8	58	41.9	
0	05.2	120	58	10	8	58	42.1	

Thermometer 50°.

Mean of 16 observations, 8*h*. 58*m*. 39.65*s*.

APPENDIX No. 5—Continued.

December 15, 1846.—*San Diego.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
4	17	32.0	68	33	55	32	45	41
4	18	27.8	68	33	35	32	45	30
4	19	21.5	68	33	55	32	45	39
4	20	49.2	68	33	55	32	45	37
4	21	33.0	68	33	45	32	45	32
4	22	09.0	58	33	35	32	45	27
4	23	00.8	68	33	55	32	45	37
4	23	46.5	68	33	30	32	45	24
4	24	28.0	68	34	00	32	45	40
4	25	12.5	68	33	40	32	45	30
4	25	49.0	68	33	50	32	45	34
4	26	20.8	68	33	50	32	45	34

Thermometer 50°.

Mean of 12 observations, 32° 45′ 34″.

APPENDIX No. 5—Continued.

December 16, 1846.—*San Diego.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *a* Ceti near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
6	04	16.0	121	24	45	32	44	40
6	06	24.2	121	27	40	32	44	32
6	07	36.5	121	28	35	32	44	37
6	08	16.2	121	29	05	32	44	35
6	09	41.8	121	30	40	32	44	07
6	10	53.2	121	31	20	32	43	52
6	12	04.0	121	31	05	32	43	55
6	12	43.8	121	30	20	32	44	11
6	13	43.0	121	30	30	32	43	51
6	15	08.5	121	29	00	32	44	02
6	16	02.5	121	26	20	32	45	51

Thermometer 40°.

Mean of 11 observations, 32° 44′ 12″.

APPENDIX No. 5—Continued.

December 16, 1846.—*San Diego.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of Aldebaran in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	40	14.0	90	52	50	8	58	24.7
4	41	04.8	91	13	30	8	58	25.6
4	41	41.2	91	29	35	8	58	23.1
4	42	30.5	91	49	25	8	58	24.7
4	43	19.8	92	10	00	8	58	24.1
4	44	17.5	92	23	15	8	58	25.6
4	45	25.5	93	01	35	8	58	25.1
4	46	29.5	93	29	15	8	58	22.1 rej.
4	47	27.2	93	52	15	8	58	21.7 rej.

Thermometer 50°.

Mean of 7 observations, 8*h.* 58*m.* 24.70*s.*

Time, p. m.			Double altitudes of ——— in the west.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*
5	27	32.5	104	32	40
5	28	05.2	104	14	45
5	29	03.8	103	55	10
5	29	43.5	103	37	55
5	30	29.6	103	18	15
5	31	11.0	103	01	15
5	32	10.5	102	36	50
5	35	40.3	101	58	20
4	35	21.6	101	16	10
5	36	09.8	100	56	10
5	37	06.5	100	32	30

Thermometer 50°.

APPENDIX No. 5—Continued.

December 19, 1846.—*San Diego.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of sun's upper limb.	
h.	*m.*	*s.*	*Deg.*	*min.*
11	23	04.8	48	00
11	24	26.0	47	40
11	25	05.8	47	30
11	25	43.7	47	20
11	26	22.5	47	10
11	27	01.5	47	00
11	27	38.0	46	50
11	28	19.8	46	40
11	28	55.7	46	30
11	29	31.5	46	20

Thermometer 64°.

DETERMINATION OF INDEX ERROR.

	Min.	*sec.*	*Min.*	*sec.*
On the arc	32	15	31	55
Off the arc	32	25	32	40

APPENDIX No. 5—Continued.

December 19, 1846.—*San Diego.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of —— in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
6	11	05.2	114	03	10			
6	12	09.0	113	36	25			
6	12	52.0	113	18	15			
6	13	35.8	112	59	35			
6	14	25.0	112	39	30			
6	15	17.5	112	19	50			
6	16	10.5	111	57	30			
6	17	24.0	111	25	30			
6	18	22.5	111	01	05			
6	19	54.0	110	23	00			

Thermometer 50°.

Time, p. m.			Double altitudes of α Orionis in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
6	29	36.8	97	07	30	8	57	49.5
6	30	36.6	97	29	05	8	57	50.3
6	31	21.2	97	45	15	8	57	50.5
6	32	10.0	98	04	05	8	57	47.4
6	32	56.5	98	19	50	8	57	51.5
6	33	39.8	98	35	05	8	57	51.6
6	34	28.5	98	53	15	8	57	50.0
6	35	15.8	99	08	55	8	57	53.7
6	36	00.8	99	25	30	8	57	52.8
6	36	39.8	99	40	25	8	57	50.2

Thermometer 50°.

Mean of 10 observations, 8*h*. 57*m*. 50.75*s*.

APPENDIX No. 5—Continued.

December 19, 1846.—*San Diego.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *a* Ceti near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	53	16.0	121	27	10	32	44	18
5	54	38.5	121	29	45	32	43	48
5	55	41.0	121	30	30	32	43	48
5	56	30.5	121	30	45	32	43	53
5	57	26.8	121	31	00	32	43	57
6	00	32.5	121	32	10	32	43	15
6	01	16.5	121	32	20	32	42	59
6	02	02.8	121	31	50	32	42	59
6	02	58.0	121	30	40	32	43	10
6	03	42.8	121	39	20	32	43	26
6	04	51.5	121	27	25	32	43	40

Thermometer 50°.

Mean of 11 observations, 32° 43′ 34″.

APPENDIX No. 5—Continued.

December 20, 1816.—*San Diego.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of Polaris.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
6	30	15.2	67	58	35	32	45	44
6	31	04.8	67	58	20	32	45	49
6	31	51.5	67	57	50	32	45	45
6	32	35.0	67	57	10	32	45	36
6	33	10.8	67	56	55	32	45	37
6	36	51.5	67	55	10	32	45	37
6	37	40.1	67	54	50	32	45	40
6	38	21.5	67	54	10	32	45	30
6	39	09.8	67	54	05	32	45	39
6	39	49.8	67	53	25	32	45	30
6	40	50.0	67	53	05	32	45	34
6	41	32.5	67	52	35	32	45	31

Thermometer 45°.

Mean of 12 observations, 32° 45′ 38″.

APPENDIX No. 5—Continued.

December 20, 1846.—*San Diego.*

DETERMINATION OF TIME.

Time, p. m.		Double altitudes of —— in the west.			Chronometer fast.		
m.	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
03	15.5	115	36	20			
04	11.2	115	11	10			
04	51.5	114	55	45			
05	41.5	114	31	04			
06	26.5	114	15	50			
07	15.7	113	55	40			
08	13.2	113	31	50			
08	53.2	113	15	20			
09	32.8	112	58	18			

Thermometer 45°.

Time, p. m.		Double altitudes of *a* Orionis in the east.			Chronometer fast.		
m.	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
15	16.8	93	18	55	8	57	43.0
16	18.3	93	41	25	8	57	44.5
17	02.0	93	58	40	8	57	42.0
17	51.5	94	16	30	8	57	43.5
18	40.0	94	34	50	8	57	42.8
19	30.0	94	53	40	8	57	42.1
20	23.8	95	13	50	8	57	41.3
21	17.8	95	33	45	8	57	41.6
22	05.5	95	51	10	8	57	42.0

Thermometer 45°.

Mean of 9 observations, 8*h.* 57*m.* 42.58*s.*

APPENDIX No. 5—Continued.

December 21, 1846.—*San Diego.*

DETERMINATION OF TIME.

Time, p. m.			Double altitudes of *α* Andromedæ in the west.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
6	03	19.2	99	40	55	8	57	28.3
6	04	14.5	99	18	10	8	57	29.3
6	05	00.5	98	58	25	8	57	28.1
6	05	52.8	98	37	05	8	57	29.5
6	06	45.8	98	14	05	8	57	27.4
6	07	31.0	97	54	40	8	57	26.4
6	08	20.0	97	35	25	8	57	29.3
6	09	09.2	97	14	50	8	57	29.3
6	09	52.5	96	56	20	8	57	28.6

Thermometer 45°.

Time, p. m.			Double altitudes of *α* Orion in the east.			Chronometer fast.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
6	16	16.8	95	15	30	8	57	25.8
6	17	06.8	95	34	15	8	57	25.1
6	18	00.5	95	53	50	8	57	25.7
6	18	57.8	96	15	05	8	57	25.3
6	19	40.5	96	30	15	8	57	27.1
6	20	25.7	96	48	05	8	57	23.3
6	21	16.5	97	05	30	8	57	26.3
6	22	06.0	97	23	35	8	57	26.4
6	23	03.5	97	45	40	8	57	23.3

Thermometer 45°.

Mean of 18 observations, 8*h*. 57*m*. 26.90*s*.

APPENDIX No. 5—Continued.

December 21, 1846.—*San Diego.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *α* Ceti near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	42	48.0	121	23	40	32	44	32
5	44	04.5	121	25	45	32	44	29
5	45	36.0	121	27	05	32	44	45
5	46	58.0	121	28	45	32	44	32
5	48	15.8	121	28	45	32	44	53
5	50	11.8	121	29	35	32	44	45
5	51	04.0	121	30	00	32	44	30
5	52	25.7	121	29	10	32	44	42
5	53	36.6	121	28	50	32	44	30
5	54	43.0	121	27	35	32	44	38
5	56	15.2	121	25	55	32	44	45
5	57	26.2	121	23	40	32	44	51

Thermometer 45°.

Mean of 12 observations, 32° 44′ 39″.

APPENDIX No. 5—Continued.

December 23, 1846.—*San Diego.*

DETERMINATION OF LATITUDE.

Time, p. m.			Double altitudes of *α* Ceti near the meridian.			Latitude.		
h.	*m.*	*s.*	*Deg.*	*min.*	*sec.*	*Deg.*	*min.*	*sec.*
5	33	04.0	121	20	10	32	44	57
5	34	05.5	121	22	45	32	44	38
5	35	16.0	121	26	60	32	43	28 **rej.**
5	36	32.0	121	27	20	32	44	10
5	37	15.0	121	28	00	32	44	15
5	38	09.8	121	28	45	32	44	20
5	38	51.8	121	29	05	32	44	26
5	39	55.5	121	29	50	32	44	22
5	41	06.5	121	29	50	32	44	34
5	42	16.2	121	30	30	32	44	17
5	44	23.8	121	30	20	32	44	03
5	45	24.6	121	29	00	32	44	23
5	46	21.8	121	28	20	32	44	17
5	47	33.0	121	27	40	32	44	00
5	48	35.7	121	24	40	32	44	46
5	49	25.8	121	23	05	32	44	55
5	50	21.5	121	22	40	32	44	15
5	51	09.8	121	21	05	32	44	18

Index error + 17.5″

Thermometer 54°.

Mean of 17 observations, 32° 44′ 24″.

APPENDIX No. 5—Continued.

December 23, 1846.—*San Diego.*

DETERMINATION OF TIME.

ne, p. m.		Double altitudes of *a* Andromedæa, in the west.			Chronometer fast.		
n.	*s.*	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
4	56.5	99	41	10	8	56	58.0
5	33.0	99	26	10	8	56	58.7
6	16.8	99	07	25	8	56	57.7
7	08.5	98	46	15	8	56	58.9
7	58.2	98	26	10	8	56	60.4
8	54.6	98	01	50	8	56	58.9
9	52.8	97	37	20	8	56	58.5
1	23.8	96	59	15	8	56	58.5
2	10.0	96	39	40	8	56	57.8

Thermometer 54°.

ne, p. m.		Double altitudes of *a* Orionis, in the east.			Chronometer fast.		
	s.	*Deg.*	*min.*	*sec.*	*h.*	*m.*	*s.*
6	25.5	94	42	45	8	56	54.8
7	17.5	95	01	45	8	56	54.3
8	02.5	95	18	35	8	56	55.1
8	57.6	95	38	35	8	56	55.9
9	47.8	95	56	10	8	56	58.6
0	25.2	96	10	35	8	56	56.9
1	02.0	96	23	25	8	56	58.7
1	55.6	96	43	45	8	56	56.5
2	43.5	97	01	20	8	56	56.7

Thermometer 54°.

Mean of 13 observations, 8*h.* 56*m.* 57.52*s.*

APPENDIX No. 6.

WASHINGTON CITY, *October* 8, 1847.

SIR: I have the honor to submit, herewith, a report of such objects of natural history as came under my observation while I was attached to the topographical party, under your command, during the journey from Fort Leavenworth to Bent's Fort.

The plants which were collected were submitted to the inspection of Dr. Torrey, to whom I am indebted for their names.

With great respect, I am, sir, your most obedient servant,

J. W. ABERT,
Lieutenant U. S. Top. Engineers.

To Lieut. W. H. EMORY,
U. S. Topographical Engineers.

Notes of Lieutenant J. W. Abert.

On the 27th of June, 1846, we set out from Fort Leavenworth. The day was clear and bright; the woods were rejoiced with the voice of the mocking bird, and of the many little warblers that would join in the chorus of his song; the bluebird was there with his sprightly notes, and the meadow lark, perched on some tall mullein weed, carolled forth his song of love. As we were heartily tired of remaining quiet, we were well prepared to enjoy the beautiful scenes that our progress gradually developed. The ground is what is called "rolling prairie," of gentle curves, one swell melting into another.

The soil around is extremely rich; the whole country is verdant with the rank growth of the "tall grass," as it is called by way of eminence, when compared with that which grows beyond the region of the walnut and the hickory.

Here are many varieties of useful timber; the hickory, the walnut, the linden, the ash, the hornbeam, the maple, the birch, and the beech, also the cotton-wood; but, beyond the limits of the "tall grass," there is the cotton-wood only.

Five miles from Fort Leavenworth we passed a large butte, called "Pilot Knob;" its top is flat, and unites with the vallies below in a curve like that of a rope slackly drawn; spreading over the valleys, and climbing almost to the top of the butte, we saw fine forests of timber, consisting chiefly of oak. Among the shrubs, we noticed the hazel, (corylus Americanus,) and the button bush, (cephalantus occidentalis,) among these the wild grape had twisted

rils and was growing so luxuriantly that it was with great
y one on horseback could force his way through.
e hill sides the wild rose was still in bloom, and mingled
flowers with the beautiful white clusters of the Jersey tea,
ius Americanus.) The prairies were covered with tall
f the rattlesnake weed, (rudbeckia purpurea.)
of our mules proved very refractory, but we soon con-
them with the aid of the "lazo," or cabresto, as it is often
a rope of hair or plaited hide, 50 to 60 feet long, in which
is formed that, by a skilful hand is easily thrown over the
ead; the noose being gradually tightened, the animal soon
all appearance lifeless. Now, the bridle, the saddle, and
e fixed, the noose loosened, and the mule rises ready for
ney.
a march of twelve miles we encamped near a log house,
a fine spring of cold clear water. Here we noticed the
ckory, or downy hickory, (juglans pubescens,) the chest-
(quercus primus acuminata,) the spicewood, (laurus ben-
id, deep in the woods, the modest May apple, (podophyl-
atum,) and bloodroot, (sanguinaria canadensis.)
retired to rest, the sky became cloudy, and in a little time
ful shower of rain fell, which annoyed us greatly as it
rough our tents.
–During the early portion of the morning, the rain con-
ith some abatement, and, as the sky showed signs of clear-
we commenced making our arrangements for the march.
lown to a log-house close by, and, whilst examining it, was
l by the chirping of birds, and, on searching, found that
id proceeded from the chimney, and I there discovered a
l nest, in the shape of a half basket, firmly attached to the
walls with clay, lined internally with horse hair and soft
nd covered externally with moss; within were five un-
birds, their eyes scarcely open, and at every sound they
iey would open their mouths and scream for food. The
parent several times darted down near my head. I wished
ascertain its species, but, although it lit on the trees near
e, I could not get near enough to make any decision, and,
not desire to kill a bird with young, I had to content my-
h the name some of my people gave it, to whom I pointed
nd who called it the "grey bird."
some little trouble with the mules, we got off about 7
the rain had made the roads slippery, and the wheels cut
soft mould so that the mules labored hard; at length we
a sudden rise where, in spite of our efforts, we were obliged
in until one of the volunteer teamsters, seeing our diffi-
ndly brought us three yoke of oxen, and soon drew us up
e. Passing on over gently rising and falling swells and
vith the delightful breeze that one almost always meets on
ries, we felt our spirits rising with the clearing away of
ds, and when the sun broke forth in splendor, the sensa-
truly exhilirating. Whenever we rode to one side of the

road we noticed that our horses would frequently sink to the fetlock, and saw on the ground little piles of loose earth, like small ant hills, being about 5 inches high and 10 or 12 inches in diameter at the base, and without any opening; they are formed by the sand rats or gophers, (pseudostoma bursarius,) and although their habitations cover the prairies, there are few persons I have met with who have ever seen them.

On our route we started several prairie chickens, (tetrao cupido.) After a march of 11 miles we reached Stranger creek, a romantic little stream of water, clear as crystal, that ripples over a pebbly bottom. The banks are high and composed of rich loam that nourishes immense oaks and sycamores, (platanus occidentalis.) The banks were now so slippery from the rain, and so steep withal, that we were necessitated to unload our wagons before we could achieve the ascent. We were soon encamped, and had our bedding exposed to the sun to dry. We noticed a great quantity o the orange colored asclepias, (asclepias tuberosa,) around which gaudy butterflies were flitting. The low grounds near us were covered with a prickly button-head rush, (eryingium aquaticum,) the roots of which, when candied over, formed the kissing comfit of Falstaff.

The woods were skirted by a dense growth of hazel, plum trees, and tangled grape vines. Here, too, we found the little quail, (ortix virginiana,) suddenly rising up from under our feet, and startling us with the whizzing sound of its wings. This evening the musketoes were very numerous and we lay down to be tormented b these provoking pests; but few of us were able to sleep, althoug none of us slept very comfortably last night.

29th.—Yesterday evening, we found that the hind axeltree o our wagon had been split in crossing the creek; and, being fearfu lest we should break down at some place where good timber coul not be obtained, we sent out two men to procure a piece of timber, and they soon brought in a fine piece of hickory, dragging i into camp by means of a "lazo" that they had affixed to it an had then passed round the neck of a mule. Luckily for us, ther was a good carpenter in the volunteer camp, and, although hi tools consisted only of a saw, an axe, a drawing knife, and a auger, he, nevertheless, managed to fashion a very good axletree This work detained us until 1 o'clock, when we started for th Kanzas river, having, through the kindness of Colonel Ruff, obtained a new teamster in place of the one who deserted last nigh

The prairie was yet what is called rolling; the flat bottoms wer covered with the rosin weed or polar plant, (silphium laciniatum, whose pennate-parted leaves have their lobes extending like finge on each side of the mid rib. It is said that the planes of the leave of this plant are coincident with the plane of the meridian; bu those I have noticed must have been influenced by some local attraction that deranged their polarity.

The orange colored asclepias, (A. tuberosa,) and the melanthium virginicum, a white-flowering bush, were also abundant.

The timber on the ravines consisted of the white oak, (Q. alba, lack jack oak, (Q. ferruginea,) mulberry, (morus rubra,) walnut, F. nigra,) the hickory, the red bud, (ericis canadensis.) The ettles (urtica canadensis) had grown to the height of 7 or 8 feet, ll of which show the prodigal fertility of the soil.

As we approached the Kanzas river its tributaries seemed to multiply rapidly, and the rolls in the prairie became more abrupt. At 3 o'clock, we ascended a high ridge that gave us a fine view of the whole surrounding country. Presently reaching a little tream, whose banks were excessively steep and slippery, the wagons attempted to ascend; but one of the wagon wheels sunk deep n the mud, and completely stopped all progress; we were therefore obliged to unload everything, and then clap all hands to the wheel, when we rose the hill amid the cheers of the men. A Frenchman, mounted on a wild mule, had already crossed and was tanding on the western bank, which is 10 or 12 feet in height, when the mule suddenly sprung off the bank into the creek, just grazing with its feet the head of one of the men over whom it passed in its desperate leap. No one was hurt, and the Frenchman still sat as firm as ever.

As we neared the Kaw or Kanzas river, some of us went in advance, and soon reached an Indian house; the occupants said they were Shawnees. They appeared to be very comfortably fixed; had plenty of fine looking cattle, pigs, and chickens; within a few yards of the house, a clear stream of good water spouted forth from the side of a hill. We learned of the Indians that the distance to the Kaw river was 1½ miles.

Crossing a high ridge, we enter the Kanzas bottom; it was overgrown with a tall grass (arundo phragmites) from 5 to 6 feet high, and mingled with this was the long-leafed willow and the cottonwood. A quarter of a mile from the river bank, we entered the timber, consisting of the varieties already mentioned; the ground on which it grew was a deep loose sand difficult to get through.

In the river we found two large flat boats or scows manned by Shawnee Indians, dressed in bright-colored shirts, with shawls around their heads. The current of the river was very rapid, so that it required the greatest exertions on the part of our ferrymen to prevent the boats from being swept far down the stream. We landed just at the mouth of the Wakaroosa creek. Here there is no perceptible current; the creek is 14 feet deep, while the river does not average more than 5 feet, and in several places is quite shoal.

It was nearly 10 o'clock before all our company had crossed, and was so dark that we could scarcely see to arrange camp; so we lay down on the river bank and sent our horses out on the prairie to grass. We finished our suppers at 12 o'clock and lay down again to sleep; but, worn out as we were, the mosquitoes showed us no compassion, and large hooting owls, (bubo virginianus,) as if to condole with us, commenced a serenade.

The pure cold water of the Wakaroosa looked so inviting that some of us could not refrain from plunging beneath its crystal surface; one of the flat boats formed a convenient place from which to spring. The sun was rising, surrounded by golden clouds; in one of the flat boats, three of the Indians who had assisted in ferrying us over were soundly sleeping, and far away stretched the gradually diminishing trees that overhung the Kanzas water; the king-fisher (alcedo alcyon) was dartling along, uttering his shrill rattling scream; flocks of paroquets (centurus Carolinensis) were circling over head, screaming and darting amid the tall walnut and sycamore trees.

We now made ready for our march, having engaged a fine looking Indian lad to go with the party. Our horses had not had much time to eat last night, and seemed disinclined to pass through the luxuriant grass that lay on each side of our road, and were constantly trying to snatch a mouthful of the delicious herbage.

At 8¼ o'clock we had a glimpse of the Wakaroosa buttes; on our right there was a large corn-field, of about 30 acres; then a line of timber, stretching as far as the eye could reach; on our left lay the broad rolling prairie, and directly in front we could see the road crossing the swells of the prairie, until it could be no longer distinguished. As we continued to advance, we found that our road led us directly between the two buttes.

We soon reached them, and then saw the "divide" that separates the waters of the "Wakaroosa" from those of the "Marais des cygnes," or Osage, (as it is called near its mouth;) upon this divide the Santa Fé road is laid out.

We soon saw the Oregon trail, which here unites with that to Santa Fé; shortly after passing the junction of these trails we reached a steep declivity that forms the bank of a small stream, and noticed that the Indians had been working here for coal; in the superincumbent shale we found traces of fossils resembling the broad flat leaves of the iris (Iridæ.) While we were examining this formation, my horse, that had been driven almost mad by the flies, (tabani,) broke from his fastenings and rushed into the creek, in order to roll in the water, and thus free himself from his tormentors; what a misfortune! for my saddle and pistols were on his back; some of the party dashed towards him, and, springing up, he galloped off, scattering all my accoutrements on the road; but I recovered every thing, even my pistols.

We continued on over a broad flat bottom of marshy land, but found, before we had proceeded far, that our course bore too much to the north. We, however, continued to follow on in hopes it would take a turn, but were disappointed. As it was now late, we encamped on the Wakaroosa river, having marched nine miles. During the day, our animals suffered greatly from the horse-fly, (tabani;) these flies completely covered the necks and shoulders of the horses and mules, tormenting them excessively.

Amongst the birds observed this day, were the dove, (ectopistes Caroliniensis;) the flicker, (picus auratus,) the blue bird, (sialia Wilsonnii;) the bunting, (pipilo erythropthalmus;) and the crow, (corvus Americanus.) The last mentioned birds were lounging near a large corn-field, and were, doubtless, watching with interest the ripening of the grain.

Those friends of the prairie voyageur, the cow-bird, (molothrus pecoris,) made their appearance, and no sooner had we picketed our animals than those birds installed themselves on their backs.

The elder (sambucus pubescens) was still in bloom, and the orange asclepias still displaying its gaudy flowers, much to the delight of the brilliant butterflies that sported around it, and are so constantly found near it, that it is often called the butterfly plant.

Our camp is on a high point which separates the branches of a little stream; the grass around is good, and our situation high, and must bid defiance to the mosquitoes. Along the margin of the creek I found a beautiful lily, (lilium tigrinum,) of a bright orange color, and beautifully dotted.

On *July* 1 we arose early and made our way back to the trail we had left. After a march of three miles we reached the route sought for; we then rose to the top of the "divide," which unites with the Wakaroosa valley by a series of slopes that resemble the exterior slopes of parapets, their crests changing direction suddenly, so as to form sharp angles like those of a bastion; we ascended 15 feet, and on taking a bearing back, found that the Wakaroosa buttes were north 40° east,

After travelling three miles further, we reached the broad trail of the traders from Independence, Missouri, to Santa Fé.

As our horses moved through the grass, the horse-flies seemed to be shaken from the spikelets, as the farina from the stamens of corn, when shaken by the wind; then rising up they covered the heads and necks of the poor animals, making them frantic with pain; they would rub against each other, and stamp their hoofs; and some would place their heads so as to get the benefit of the switchings of another's tail; and even the riders were annoyed by their desperate efforts to get rid of these persecutors.

Before we had proceeded far, we met a man driving an ox team; he had accompanied some of the volunteer companies to carry provisions; and, having emptied his wagon, he was now on his return. He told us that it was twenty miles from the next pool to water, so we determined to camp soon; and, having made a march of eleven miles, we pitched our tents on the very same spot on which we had encamped one year previous. Here we collected some beautiful flowers, amongst which were the rudbeckia hirta, and the delicate bed straw, (galium tinctorum.)

The stream upon which we were was then merely a line of unconnected pools. The only trees to be seen were some tall elms, (ulmus Amer.,) in whose tops several turkey vultures (cathartes aura) were preparing to go to roost, while below, amongst the willow brush that bordered the stream, some cat birds (orpheus carol.) kept up a low conversation as they plunged into the inmost recesses of the undergrowth.

July 2.—As we had the twenty mile stretch to make to-day without water, we arose early. The dew last night had been very heavy, and we found little pools of water standing on the tops of our musquito bars, for we had been obliged to desert the tent where our bars could not be fixed conveniently.

The mounds made by the gophers or sand rats were more abundant than heretofore, and in several places a number of these mounds had been made so close together that the distinctness of each was completely lost in the mass, covering an area of five or six feet.

Our road was full of plovers, (charadrius marmoratus;) they would run along before us with great rapidity; then stop until we approached quite close, when they would run off again. Thus they kept travelling before us all day. We shot several of them, and I preserved some of their skins, more as a memento of the prairies than as a curiosity, for these birds are very abundant in the United States, from Canada to the gulf of Mexico.

As we proceeded on our journey, we heard the confused hum of thousands of grasshoppers, now and then broken by the chirping of the cricket. These insects are found in great abundance, and obtain greater size than any I have seen elsewhere. I got a cricket this morning that measured 1½ inches in length of its body.

We now entered on the level prairie, where nothing was to be seen but a wide expanse of green grass, and the sky above filled with cumulus clouds, the shadows of which, as they fell upon us, added to the refreshing effects of the delightful breeze one generally meets upon the prairie. After travelling a long distance over a country, the irregularities of which were so imperceptible that one almost doubted their existence, we reached that position which I took to be the top of the divide. Here lay the half devoured carcass of an ox that had, doubtless, succumbed to the fatigues of the journey and deprivation of water; for these animals suffer much more from the want of water than the mule. Some turkey vultures, sailing above our heads, showed that they were not ignorant of the locality of the carrion.

In a little while after passing the ox's carcass, we reached 110 mile creek, which is 22 miles distant from our last night's camp. At this creek there is a fine grove of timber, containing all the varieties found in the vicinity of the Kanzas river.

About 12 o'clock we reached this creek, and we here found the robin, (turdus migratorius,) the cat bird and the blue bird; and, high above us, the swallow-tailed hawk (nauclerus furcatus) was sweeping round in graceful circles, its white head glancing in the sunlight. I asked the Indian lad to shoot it for me with his rifle; but he gazed upwards at the bird, and seemed so struck with the beauty of its movements that he uttered not a word, but shook his head to signify that the bird was too fair for him to kill it. I should think it impossible for smaller birds ever to escape this hawk, which unites the form and swiftness of the swallow with the boldness and strength of wing of the falcon.

Nigh the banks of the stream there was a low piece of ground covered with the purple monarda, (monarda allophylla.) The gaudy butterflies that I have spoken of before, as flitting around the asclepias were now sucking the sweets of these flowers.

Before we had fairly pitched our tents, young Mr. Nourse, of Washington city, entered our camp. He had, alone, boldly set off from Fort Leavenworth the day after we had left, determined to overtake us. We were delighted at his safe arrival; nor were we less pleased when we found that he had brought letters from the friends and relatives whom we had left behind.

July 3.—We arose early this morning to gain as much of the cool portion of the day as possible, determined to push on and see if we could not get rid of the flies that are so troublesome to our horses. The poor brutes seem to have no time to graze; and, when picketed out, they employ their feeding time in rolling in the grass and kicking frantically, so that the ground resounds with the stamping of their hoofs; and, in taking observations with the aid of the artificial horizon, one is obliged to select a spot at some distance from the horses, to prevent the jar which they produce from disturbing the surface of the mercury. The season appears to be unusually dry; 110 mile creek, which at this time last year was full of water, now has only a few scattered pools in its bed.

All day we had a brisk breese from the southwest, making the travelling very pleasant. The plover and cow-birds were playing along the road in front of us, and catching the grasshoppers that were scattered around in unlimited profusion.

At 10 o'clock, having marched 15 miles, we reached Independence creek, so called by Colonel Frémont, in consequence of our encamping here on the 4th of July, one year previous. This creek contains the only running water we have seen since leaving our camp by the Wakaroosa river. Along the road side, I gathered a plant called lamb's quarter, (chenopodium album,) the plaintain weed, (plantago major,) and a beautiful sensitive plant, with a yellow flower, slightly resembling the violet, (cassia chamaecrista.)

We encamped seven miles beyond Independence creek, in a ravine timbered with the elm, the cotton-wood, the hickory and the oak. Some of our hunters went out and killed several wild turkeys, (meleagris gallopavo.) We saw a flock of curlew, (numenius longirostris,) and some teal, (anas carol.)

Saturday, *July* 4.—At 5½ o'clock, this morning, we crossed the creek upon which we had encamped, and soon reached an elevated piece of ground, from whence we could see our road crossing a high ridge in a direction S. 60° W. Whilst prosecuting our march we noticed two distant spots in the horizon; and, as we neared them, we judged, from the white light that one of the objects reflected, that they might be mounted men. Before long we met them, and found our conjectures correct. They said they were traders, and had been as far as Council grove.

At 7 o'clock, we crossed a stream of running water; at 8 o'clock we reached one composed of pools, its banks heavily timbered with walnut, and we also noticed the buckeye, (pavia lutea,) and, skirting the stream, gooseberry bushes, (ribes triflorum,) and elder. At 12 o'clock, we reached Rock creek. This stream is very appropriately named, as its banks chiefly consist of rock. Near where the road crosses, there is a large pool from four to five feet in depth, forming a fine bathing place; but we did not stop here, as we were anxious to reach some eminent place, in honor of the day. We pushed forward for "Big John spring," which we reached at 5 o'clock. Here we luxuriated on the delightful cool water of this celebrated spring, reclining under the shade of a tall oak "sub tegmine querci," at whose base this spring originates; the temperature of the water being 53°, while that of the air ranges above 80°.

We saw to-day two beautiful varieties of the evening primrose, (œnothera biennis,) the white and the yellow. We noticed amongst the birds the brown thrush, (orpheus rufus,) the king bird, (muscicapa tyrannus,) the grouse (tetrao cupido,) and the little quail.

Sunday, July 5th.—We wished, as we started this morning, that we could have taken this spring along with us, the water was so beautifully clear and so cold, and the spring shaded from distance around by a grove of the walnut, the sycamore, and the oak, around the trunks of which the ivy (rhus radicans) clambered, and at the roots of which grew beautiful lychnis.

Two miles from our point of departure is Council grove, where there is a fine stream of running water, and great quantities of quartz and highly fossiliferous limestone.

Shortly before Council grove, we passed the grave of a white man, who had been murdered by an Osage Indian; a circular pile of stones marks his resting place; from the crevices between the stones the ivy has shot forth; over the grave a long pole leans mournfully. When I viewed this simple grave, my mind turned to the proud monuments which are built up by the wealthy in our great cities, and which are daily levelled with the ground to give place to some improvement. Here, on the wild prairie, the Indian and the rude hunter pass by this spot, and not for worlds would they remove one stone.

Continuing our march, we travelled over a distance of 20 miles, when we reached "Diamond spring." This is a fine large spring, of three or four feet across, the water extremely cold; the temperature of the spring is 54°, while that of the air, the thermometer in the shade, is 87°.

I procured at this place a beautiful white thistle, (cnicus acarna,) of delicious fragrance. We saw a great many night hawks (chordeiles virgin.) and plovers, as well as several herds of deer, (cervus virginianus) I also collected some of the great grasshoppers of the prairies.

Monday, July 6th.—As we set out on our march, the wagon mules took a freak in their heads and endeavored to run off with the provision wagon, but the driver turned them into the wide prairie, and soon succeeded in quieting them for a time, but he had several trials for the mastery before the day's march was over. After travelling 15 miles, we arrived at "Lost spring," but did not stop, as its appearance was not inviting.

We noticed near the road numerous large puff-balls or fungi, that resembled, both in size and appearance, human skulls of most beautiful whiteness; the under side is puckered as if a napkin had been thrown over a round body and drawn with a string; the interior resembles flour, except that it coheres.

Continuing our journey, we pressed forward rapidly, in order to reach Cotton-wood fork, which is nearly thirty miles from the place where we were encamped this moring. We had a tedious march and did not reach the creek until 3 o'clock.

Our animals were very much jaded, and add to this, that the moment we reached our goal, myriads of horse flies attacked our cavalcade furiously. In the efforts of the beasts to rid themselves of the flies, they often became entangled in the "cabrestoés;" we were obliged to protect some of them by loose clothing; the mosquitoes, too, were troublesome to horses and riders.

Cotton-wood fork is a tributary of the Neosho, as well as Council grove creek and the waters intermediate. This stream is timbered with large cotton-wood trees that keep a continued rustling of their leaves, for the slightest breeze makes them tremble.

We noticed here thickets of the elder (S. canadensis) in full bloom. The beautiful monarda (M. allophyla) covered the low portions of the banks of this stream, while on the little sand bars, and close to the water's edge, a dense growth of the long-leaved willows overhung the clear water, in which sported the black bass, the cat fish, and the sun fish. Just where the road crosses, there is a fine pool of water, from five to six feet deep and twelve feet wide.

Tuesday, *July* 7.—We concluded that it would be best to remain here for the day, as our animals looked much harrassed by what they have already undergone. We employed ourselves in getting all our affairs arranged in complete order; for we expect that this is the last stop that we shall make for some time to come. Everything was overhauled, our clothes were all washed, and all those arrangements, such as a journey of this kind suggest, but which our continued movement did not permit us to accomplish, were this day executed.

Around our camp the ground looked golden with the different varieties of the golded rod, (solidago,) and along the stream we saw box elder, (acer negundo,) and extended tickets of plum bushes.

Not far from the camp we saw some antelope, (dicranocerus furcifer,) so we sent out an old voyageur with the Indian hunter in pursuit of them, but they returned unsuccessful, and reported that the antelope were extremely shy.

About 4 o'clock, several companies of volunteers made their appearance, and until it was quite late we heard the tramp of horses, the clashing of sabres, and jingling of spurs; at last they all arrived, and the camp was quiet, save the howl of the sentinel wolf.

Wednesday, *July* 8.—At 5 o'clock this morning we were on the route for the Turkey creeks; they are three in number, and unite a few miles below the point where our road crosses them; the day was pleasant, for the s y was overcast.

We had now reached the short grass, that is, not more than four or five inches in length, and we saw little patches of the true buffalo grass, (sesleria dactyloides,) a short and curly grass, so unique

in its general character that it at once catches the ey
eller.

On either side of us we observed little circular spot
places where the buffalo once wallowed; for these huge
a habit of throwing themselves on their sides upon
they then commence walking, as it were, with their
circumference of a circle; this causes their bodies to
thus result circular depressions in the prairies; these
are for a long time filled with water, with which th
often fain to slake his thirst.

These old wallows are now overgrown with plan
more luxuriantly than on other portions of the prair
the splendid coreopsis (coreopsis tinctoria) and the sil
euphorbia; (euphorbia marginata;) these at once a
tention.

It is seldom, now, that the buffalo range this far; n
excrements are to be seen, and the bleached bones
plains by the hunter have long since mouldered awa
the close of the day we found the frontal bone of a b
the only sign, in addition to the wallows, of this a
been once abundant.

Along the road were numbers of the beetle, laying
ter stores, "haud non ignari aut incauta futuri." W
noon at 11½ o'clock. After a halt of half an hou
again, and at 12½ o'clock formed our camp on T
Here not a stick of timber is to be seen, but we foun
tiful plants with brilliant scarlet flowers (malva peda
which are eatable. We also obtained specimens c
blanche, (psoralea esculenta,) and in the waters of
we caught some sun perch and catfish.

The men killed several rattlesnakes near our car
grey snake, marked with a row of blackish spots al
it is said never to exceed two feet in length, and
grey rattlesnake. Before dark, the sky became blacl
whose appearance was soon followed by a heavy sh

This day, 9th, at daylight, we struck our tents an
our march; heavy clouds were at intervals passing
completely deluging us with rain. When the rain
we would stop a few moments and let our anim
noticed some buffalo skulls near the road; they m
here many years, as they were crumbling to pieces.
we reached the Little Arkansas, a tributary of th
the name of which it bears. This stream is from fiv
in width, and averages five inches in depth; on i
some large elms and box elder; we also saw the c
(sambucus,) narrow leafed willow, and the grape, (vi
the sorel (oxalis stricta) and lamb's quarter, (chenop
grew near the stream.

The rain had ceased as we entered camp, and
lope appeared abundant and at no great distance,

sent to shoot some of them, but his gun had got so wet during the day it would not fire

We noticed to-day the pink sensitive plant (schrankia uncinata) of most delicious fragrance, so that my hat, into which I had thrust some specimens, was pleasantly perfumed. With this plant, we also found a white variety, (darlingtonia brachypoda;) the flowers and leaves are smaller than the plant first mentioned, and has no odor.

Late in the evening several of the volunteer companies came up; they said they were suffering for want of provisions; as the commissary wagons had got on too far in advance, they sent forward to have some of them return. But we were all suffering from a cause that produced in some of us feelings more unpleasant than hunger; the blowfly had 'peopled our blankets with living masses of corruption; it is said that these insects were never before seen so far out in the prairies.

Friday, 10*th*.—It is still raining, the clouds are chasing each other rapidly across the sky, and now and then the rain pours heavily down. We remained in camp some time, waiting for the rain to stop. We thus lost several hours, but we found travelling in the prairies rather increased the chafing of our animals. We noticed to-day some swallows, (hirundo bicolor,) also the turtle dove, the little quail, the blue jay, (garulus cristatus,) and the king fisher (alcedo alcyon.)

We collected some lamb's quarter and had it cooked, and noticed along the road side the purslane, (portulaca oleracea;) this also would answer for the table of the prairie voyageur. Our day's journey was 16 miles.

Saturday, 11*th*.—We were up this morning at 3½ o'clock, and ready for the start. Our arrangement of mosquito bars was broken in upon last night by a heavy shower of rain that forced us to retreat to our tents.

After marching three miles, we reached Cow creek; it was very difficult to cross on account of the miry bottom, but we got safely over without great delay. Before we had proceeded far, we caught sight of the "plum buttes," bearing N. 20° W. We passed through a large village of prairie dogs, (Arctomys Ludoviciana;) although now deserted, there were fresh signs of the dogs having thrown out some earth from their excavations. Last night's rain had, doubtless, forced them to leave their houses. In the ponds that had settled on the plain, we saw several craw fish, and the crickets were gathered around some ant hills. As our wagons moved along the road, the lizards (lacerta lineatus) were darting rapidly along the ruts in front of it, anxious to escape being crushed. The common land turtle (testudo clausa) were also very abundant. As we got quite near the plum buttes, we caught sight of the buffaloes, (bos Americanus,) and some five or six of our party immediately gave chase. The buffaloes ran around in a circle of three-fourths of a mile in diameter; so those who were near the centre of this circle had an excellent view of the chase. Holster pistols were the only arms used, and we soon had the pleasure of seeing one of the animals fall; the other then turned off into the wide prairie.

Near the buttes we collected some beautiful Gaillardias of different species. Gaillardia amblyodon and G. pinnatifida we found abundant over the remainder of our day's route. After a march of eight miles more we reached the banks of the Arkansas river, where we encamped. Here we found a large train of wagons, belonging to Messrs. Hoffman, of Baltimore.

Sunday, July 12th.—We left the Arkansas and marched to Walnut creek, where we found Mr. Hoffman's party, they having started before daybreak. We here noticed the prairie gourd (cucumis perennis) and the cactus, (cactus opunta;) also the "pinette de prairie," or liatris pychnostachia, with a great abundance of the common sunflower, (helianthus annuus;) the bright scarlet malva (malva pedata) and the silver edged euphorbia, (E. marginata;) also the purslane, the convolvulus (ipomea leptophylla) rudbeckia hirta, and a species of cockle burr; and on all sides the little mounds of loose earth thrown up by the gopher, (psedostama *bursarius.*)

We left Walnut creek at 3 o'clock, and entered upon vast plains of the buffalo grass, (sesleria dactyloides.) After a march of 11 miles we camped within five miles of the famed Pawnee rock. Our camp was a mile from the river; but we drove our horses to water and got our buckets filled. As there was no wood, we used the "bois de vache," and lay down near the smoke of the fires to avoid the mosquitoes. We had no sticks to support our mosquito bars. When we first arrived, the country around was covered with buffalo, but it was too late in the day to hunt; we therefore lay down quietly, with the intention of having a fierce chase in the morning.

July 13th.—Last night we had a terrible serenade from a large drove of prairie wolves, (canis latrans.) These animals always hang on the heels of the buffalo, to pick up the infirm and those the hunters have wounded, as well as to prey on what is left of the slaughtered.

We got off in good time, and Lieutenant Emory, in company of one of our hunters, started for the buffalo. We saw the chase; as the herd would divide, and let the horsemen pass through, we heard the rumbling sound of their many feet; but at last they crossed the bluff that extends towards the north from Pawnee rock, and were lost to our view. Lieutenant Emory killed one of the herd; but our hunter came into camp empty handed. We halted a short time to pack the buffalo meat, and then proceeded to Ash creek. This creek was dry, so we continued our route among herds of buffalo that were continually dashing across our road, and at length reached Pawnee fork after a march of 18 miles.

The waters of this creek were so high that we could not cross; the trees along the sides of the banks were half hidden; the whirling eddies were rushing along with great velocity; the willows that grew on the banks were waving under the strong pressure of the water, and brush and large logs were hurriedly borne along on the turbid bosom of the stream. We therefore camped by the side of the creek to await the subsiding of its waters. The country around was covered with the (cucumis perennis) prairie gourd, and we found it to be infested with those little striped insects that so much annoy the farmer in the United States, by the ravages they commit amongst the young vines.

This creek is timbered with the elm, (ulmus Americana,) and the box elder, (acer negundo.) We frequently, during the day, noticed the purslane and the "pinette de prairie;" in the low grounds the splendid coreopsis and the euphorbia were displaying their beauties; and on the uplands the prickly pear was seen in great abundance, but it had passed its bloom.

During the afternoon a man by the name of Hughes was drowned in attempting to cross the stream; there were two men with him at the time, but the current was so violent that it soon swept him out of reach. His friends brought his clothes to our camp, where they left them until they could recover the body.

We saw to-day large flocks of the tropical or yellow-headed blackbird, (agelajus xantocephalus,) also the common blackbird, (quis calus versicolor,) and the Baltimore oriole, (icterus Baltimore.)

July 14*th*.—We were obliged to remain here all day, still waiting the pleasure of the waters. In the meanwhile I set one of the men to work to dig up a root of the beautiful prairie convolvulus, (ipomea leptophylla.) This man worked for several hours, for the ground was extremely hard, so that he was at last obliged to tear it up, leaving much of the tap root behind. This root extended for about one foot and of not more than one and a half inches in diameter; then it suddenly enlarged, forming a great tuber, 2 feet in length and 21 inches in circumference. The Cheyenne Indians told me that they eat it, that it has a sweet taste, and is good to cure the fever. They called it badger's food, and sometimes the man-root, on account of its great size, for they say some of them are as large as a man. We also procured here the Mexican poppy, (argemone Mexicana;) noticed quantities of a willow brush, and several specimens of the tooth-ache tree, (near zanthoxylum fraxinum.) This morning Laing brought me a very large toad, (rana musica,) far exceeding any I ever before have seen. During the day I made a sketch of the country around our camp; the most recognizable feature is the bluff just on the west side of the stream, close to the ford.

In the evening some of us went over to visit Mr. Hoffman's amp; one of the gentlemen attached to the party had just returned om his first hunt, having killed four fat cows and brought in their ngues. Thus far we have noticed several plants that have been common that I have neglected to mention them. One is the ad plant, or tea plant, (amorpha canescens,) and is in some places abundant as to displace almost every other herb; the other is hat our men call prairie indigo, (baptisia leucantha,) it bears a rge black cylindrical pod, filled with kidney-shaped seed.

July 15*th*.—This morning we commenced making a raft, determined to wait no longer, and by sundown had completed a raft of dry wood, capable of bearing 1,000 pounds without being ov loaded. The men worked with great energy, and it was truly exciting to see them straddle the huge logs and float down in the rapid current whose waters were rushing along with such a fierce rapidity, dimpling the surface of the stream with miniature whirlpools, and making the willows, now covered midway by the inundating waters, bend and spring as if moved by a hurricane. Sometimes rafts of brush and loose logs came rushing along, but the men stuck fast to the logs they bestrode, screaming out in wild excitement, as if to drown the gurgling sound of the wild waters.

To-day we saw several large white cranes with black-tipped wings; (grus Americanus,) and Laing killed me some rattlesnakes, (crotalus horridus) and several prairie snakes. Along the creek we found an abundance of plums (prunus virgin.) and cherries.

Thursday, 16*th*.—As our raft was now completed we commenced crossing all our camp equipage, and by 11 o'clock everything was safely transferred to the south side of the stream. We were obliged to carry over much less at a time than we had hoped to have done, for our raft, built of the dryest wood that we could find, became water logged. The elm and box elder were the only trees we could get, and when green their specific gravity is but little less than that of water. The wagon body was placed upon the raft to distribute the weight that might be placed in it equably. A rope was stretched across on which a noose could slide, and this noose, by a long rope, was attached to our raft to prevent its being swept away in case the stretched rope should break. This precaution proved most wise, as the rope did break, but the knots upon it prevented the noose from sliding off, and our craft swung round into an eddy where it was comparatively calm.

We now proceeded to cross our cavalcade; some of the horses were first driven and went bravely over; others were very troublesome, but at length, seeing their companions enjoying the luxuriant grass, they all plunged in and arrived safe on the opposite side. Some had to struggle hard to get up the banks, that, in addition to their steepness, were covered with a thick coating of mud, deposited by the waters. It was a beautiful sight to see some of the finest of our horses spring from the high banks of the stream, to see the splash of spray as it showered around when the horse disappeared, and again to see the noble animal rise above the wave, snorting and dashing the waters from his mane, as he swam for the opposite shore. Our Indian lad seemed to enter into the spirit of the scene; he seized the cabresto of one of the wildest horses and dragged him down into the water; running out upon the raft, he stood for a moment, and then plunged into the stream, throwing his arms alternately as he dashed across. It is in such scenes as this that the Indians excel; their fine limbs, dark hair, and flashing eye lend all the imagination could desire to perfect the wild grace of motion, the picturesque of attitude that such occasions develope.

The water had fallen nearly 3 feet during the past night, and as it still continued to fall, the troops commenced crossing at the regular ford, which is one-fourth of a mile above us; but lost several of their horses. To-day, the man who was drowned yesterday was buried, his body having been found by our men engaged in rafting. His friends sent to us for his clothes in which to bury him; and, before the sun went down, he was deposited in his long resting place: "requiescat in pace."

At 11 o'clock, Colonel Doniphan came to our camp and informed us that General Kearny wished to see us. We afterwards learned that the general had some inquiries to make in regard to the route by the Smoky Hill fork; a route that Lieutenant Peck and myself had travelled when we were attached to the command of Colonel Frémont; but the roughness of that country, the absence of all roads, and the scarcity of water and wood, and the poverty of the pasturage, render the Arkansas river route much to be preferred.

At 3 o'clock we commenced our march, and soon struck a road that we pursued until near 10 o'clock at night, when we encamped near some pools of water, having been made aware of our approach to them some time before they were in sight, by the cry of the killdeer plovers, (charadrius vociferous.) We soon kindled our fires of "bois de vache," and then found we had camped in a prairie dog village; a bad place for picketing horses, as the neighborhood is generally destitute of grass. On our march we obtained a singular species of cactus, resembling roundish bodies covered with long protuberances, whose tips were crowned with stars of white spines, (near mammilarea sulcata.)

We saw during the day many skylarks; (alauda alpestris;) they allowed us to approach quite close before they took wing, and as they flew through the air sang sweetly.

Friday, 17*th*.—We have now entered that portion of the prairie that well deserves to be considered part of the great desert. The short, curly buffalo grass (sesleria dactyloides) is seen in all directions; the plain is dotted with cacti and thistle, (carduus lanceolatus,) while only in buffalo wallows one meets the silver margined euphorbia; and in the prairie dog villages, a species of asclepias, with truncated leaves.

We saw several wild horses; in one group there were three, and with our spy glasses we had a fine opportunity for examining them. There was a bay, a roan, and a black; they stood for some time gazing at us as if completely absorbed in looking at the strange sight, when, as we approached, they raised their long flowing tails and dashed off with their long manes waving round their necks, and with a speed that soon carried them out of view. Unlike the mustangs, these looked to be large and beautifully proportioned.

Buffaloes seemed as if trying to surround us. We saw scarcely anything else far or near. The whole horizon was lined with them, and their figures would sometimes shoot up to an immense height, as their change of position caused the visual rays to pass through mediums of different refracting power, while seeming lakes would spring into existence, whose farthest shore seemed widely separated from us by the broad volume of water that intervened.

There were many dusky wolves (canis nubilus) prowling around

the buffalo; the latter paid no regard to them, but l
approach without showing the least repugnance,
wolves devour the young calves and attack the c
periods when they are least able to defend themselves.
of wolf does not congregate in large packs like the
but roams solitary.

This evening five Pawnee Indians came into our
were on foot, naked, and had their faces painted.
was very small, and we knew from the behavior of
that there were plenty of Indians near us, we chan
tion for one more defensible. All our horses were
to the camp; the cabrestoes were shortened; wagons
ranged, so as to form a compact ring; the arms exa
guard doubled; the whole camp was in a state of
momentarily expecting an attack. I lay for the g
the night by the side of a wagon, with my rifle acro
constantly expecting to see some redskins crawling
horses; but the night was undisturbed, save with t
wolves and the bellowing of buffalo.

Saturday, 18*th*.—This morning, as soon as it was li
large band of buffalo, not more than 300 yards fro
slowly to the ponds close by; they were to the wes
the wind did not blow towards them they paid but l
our proximity.

Some of the patriarchs of the band were on the le
all moving with slow and measured tread, as if attend
Now and then some of them would cast a sinister g
us, but still continued to move on with the same
got my spy-glass, in order to examine them with gre
and thence commenced making sketches. Soon the
ral commotion amongst the buffalo; they raised the
their heads into the air; now and then the bulls woul
other, when suddenly the whole band separated in
groups that scampered off to the four winds of heaven.
tively grasped our guns, not knowing whether frien
appear, and soon saw a number of horsemen urgi
steeds under the pricky spur. At every touch the in
gave the tails of the wearied horses were thrown int
the slow gait at which they moved showed that they h
fast and far. They were pursuing a buffalo of imm
parently wounded; the buffalo now turned, but his in
shyed, and as the horsemen passed by, we saw the s
ral shots burst forth; the horsemen now turned, an
buffalo lay extended upon the ground. We saw them
and in a little while after Captain Parsons rode into o
inquired the position of the main body, which we w
rejoin, for ourselves were suffering from the harra
had passed, and our horses were suffering from our
tated to picket them so closely for fear of Indians;
selves and our horses daily suffered for want of water
moving along, a band of buffaloes ran towards us; but
kept off some distance, running parallel with the road

friend noticed them, and as they passed, dismounted, stooped down and drew up his rifle; as the smoke burst forth from the muzzle of his piece we saw a fine buffalo cow lash her heels high in the air, and then continued to jump and kick for a quarter of a mile or more, when she fell and all the rest of the herd gathered around her. We already had the meat of two fat cows, and as the wagons were so far from the place where the cow had fallen, she was left to feed the wolves.

The ruts of the road were full of little lizards, sunning themselves; as we approached they would dart briskly away, manifestly disinclined to play the part of devotees to Juggernaut.

In crossing to the river we found the ground in many places covered with beautiful gallardias (g. amblyodon) and the eupatorium, while in the moist grounds we saw the curious dodder twining in its golden tendrils all the plants that grew around it, forming an inextricable entanglement.

Among the birds we saw many of the skylarks and several avosets (recurvirostra Amer.) The tail and its coverts white, wings black and white, legs blue, and bill recurved.

When we first struck the river we met with Major Clarke's battalion of artillery, a fine body of troops, well uniformed and of soldierly bearing

Having marched a few miles along the river bank, we formed our camp, after travelling this day a distance of 19 miles.

Sunday, July 19*th*.—Marching along the Arkansas bottom one is struck with the variety of swamp grasses. Here we find the triangular grass, (scirpus triquetir,) and mingled with it in great abundance the scouring rush (equisetum hyemale) and the beautiful liatris (liatris spicata.)

After we had started, I went back three miles to meet Gen. Kearny, in order to get some one to go with us and show us the exact location of the capture of the party of Texans by Capt. Cooke, 1st dragoons, in 1843. General Kearny detailed Lieutenant Love, who showed us the spot that we sought. On the south side of the river there is a large grove of cotton-wood trees that extends some distance along the river bank, and is the first grove of any size that the traveller west meets after passing Pawnee fork, which, by the route we came is 64 miles distant.

In the evening we went to General Kearny's camp to get some of the horses shod. We had expected to have gone not more than three or four miles, but only reached them after a ride of eight miles, so deceived were we with regard to the distance by the purity of the atmosphere. As it was quite late, we concluded to remain here until the camp should overtake us in the morning.

Monday, 20*th*.—This morning we had not marched far when we saw General Kearny's guard stop and encamp. Soon Lieutenant Emory, who had crossed the river, rode over and informed us that General Kearny was very ill, and ordered one of our wagons to remain for the purpose of conveying the general on by easy stages; for our wagon was light and had good springs, while all the other wagons with the army were without springs and roughly built, like common Santa Fé trade wagons.

This day we made a march of 31½ miles, passing along the top of a barren ridge, between one and two miles from the river. Nothing was to be seen but the curly buffalo grass, now parched by the summer's heat. The sun poured down his rays most lavishly; the men all dismounted and walked, in order to rest and to relieve themselves from the singular sensation produced by the heat. First one and then another of the party became ill, and several were seized with a severe vomiting.

In the evening I went over to Major Clarke's camp, in order to have an axletree made. There I saw many who appeared to be ill; amongst them were Captain Weightman and Lieutenant Dorn.

I returned to our camp and passed a sleepless time, listening to the footsteps of the guard; and, now and then, the conversation of the French boys broke upon the stillness of the night; they, too, were not able to sleep soundly. We were all extremely anxious with regard to General Kearny's health.

Tuesday, *July* 21*st*.—This morning we presented quite a sorry looking array of human faces. At day-break I was seized with a vomiting, which lasted for some time; I was obliged to send for the doctor. I however determined to push forward, in compliance with the order of Lieutenant Emory, who was with General Kearny, and committed myself to the wagoner's care, while Lieutenant Peck took command of the camp. Lying here, my eye roved over but a confined prospect; under me were bundles of bedding, with blankets, red, blue, and white; near me a sick man, languidly gazing upward; above me, the bended bows of the wagon that supported a large white cover, through which the sun beat with intense heat; and, in front, through a little hole, one caught sight of the landscape dancing to and fro as the wagon jolted along.

We formed our camp, after a march of 11 miles, at the Santa Fé crossing, and in the vicinity of Major Clarke's battalion of artillery, so that we could have an opportunity of completing our axletree that we began yesterday. We soon saw our wagon, and learned that General Kearny had perfectly recovered.

At this place we obtained some beautiful purple lilies, (eustoma russeliana,) and Mr. Nourse brought me a psoralia, with a monosepalous calyx. On the opposite side of the river there are several Indian bodies, wrapped in blankets and skins, exposed on platforms of lodge poles high up in cotton-wood trees, where they are safe from wolves and the sacrilegious touch of men. The air of the prairie produces rapid desiccation, and, in this respect, resembles that of Egypt and the islands of the ancient Guanches.

From the 21st of July until our arrival at Bent's fort, on the 29th, being all the time sick, I have no recollection of anything that transpired, excepting a drawing that I made of the sand rat, (pseudostoma bursarius.) The body and legs are covered with yellowish brown hair, plumbeous at the base; belly, white; anterior claws, strong and large; posterior claws, short; iris, black; ear, projecting slightly. On each side of the upper jaw are two exterior pouches, 1 4-5 inches in depth; tail covered with short hair, a little less in length than one-half the length of the body; body about 6 inches in length. The pouch is covered with short white hair, and capable of being turned inside out. This, I think, was a young one; hence the slight differences in the size and the color of its legs, and the tail being covered with hair.

Captain Turner, of the 1st dragoons, brought me a ortygometra carolinus; these birds are in plenty along the Arkansas bottom; this one was caught after a short chase, for it flew a short distance only, when it appeared to be too much fatigued, or too much bewildered to rise again.

Of the plants that occur between the Arkansas crossing and Bent's fort, I cannot do better than refer to the list appended to this report, in which they are arranged in the family to which they belong, and the locality mentioned in which they were obtained.

As one approaches Bent's fort, he meets with many varieties of artemisia, with the obione canescens, and a plant which is extremely useful to the Mexicans as a substitute for soap, by them called the palmillo, by us Adam's needle, or Spanish bayonet; its botanical name is the yucca angustifolia. We also have the prairie gourd, (cucumis perennis;) that is abundant also from Bent's fort to Santa Fé. We have the bartonia, several species of solanum, several species of œnothera, the martynia, the cleome, the salicornia, ipomœa, and erigonums. Amongst the trees, several varieties of populus, amongst which are the populus canadensis and p. monolifera; several varieties of salix, and the plum and cherry.

Amongst the animals, [illegible] have the panther, (felis concolor;) the wild cat, (felis rufa;) the white wolf, (canis nubilus;) the prairie wolf, (canis latrans;) the silver-grey fox, (canis cinerea argentus;) and the prairie fox, (canis velox;) prairie dog, (arctomys ludoviciana;) the gopher, (pseudostoma brissarius;) the antelope, (dicranocerus furcifer;) the grey bear, (ursus ferox;) also a species of vespertitia and species of ground-squirrel; it is said that there are three different varieties. Along the Arkansas, where there is sufficient cover, one finds the red deer, (cervus virgin.;) one also finds the badger, (taxus labradoricus;) and the polecat, (mephitis Amer.) The Indians at the fort showed me a racoon (procyon lotor) skin, they said had been obtained in the neighborhood.

Amongst the birds, the turkey vulture, (cathartes atra;) wild turkey, (meleagris gallipavo;) quail, (ortix virgina;) red-headed woodpecker; (picus erythrocephalus;) meadow lark, (sturnella ludoviciana;) night hawk, (chorodeiles virgin.;) cow-birds, (molothrus pecoris;) dove, (ectopistes carolin;) flickers, (picus auratus;) raven, (corvus corone;) and the railtailed buzzard, (batco borealis.) There has also been found on the Arkansas, within eight miles of Bent's fort, a singular and but little known bird, called the pasana, (geococyx viaticus.)

DICOTYLEDONOUS OR EXOGENOUS PLANTS

[See page 41.]

RANUNCULACEÆ.

Clematis Virginiana. Raton pass and the mountain pass near Santa Fé.

Delphinium azureum. Raton pass.

Podophyllum peltatum. Woods near Kanzas river, and Council grove.

Ranunculus acris. Near the Wakaroosa buttes.

Thalicterum Cornuti. Near Pawnee fork.

Anemone Pennsylvanica. Between "El Rio Cañadian" an "El Rio Moro."

Ranunculus aquatalis. Found in the "Raton creek" and head waters of the Purgatory creek.

MENISPERMACEÆ.

Menispermum Canadense. Near "Big John Spring."

PAPAVERACEÆ.

Argemone Mexicana. First seen at "Pawnee fork," thence o to the Moro.

Sanguinaria Canadense. Woods near the Missouri and Ka rivers.

CAPPARIDACEÆ.

Polenisia gravolens. Near "Bent's Fort," and in the valle of the Timpas.

Cleome integrifolia. At "Big Sandy creek," "Bent's Fort, and Cañadian.

VIOLACEÆ.

Viola cucullata. Banks of "Pawnee fork."

CARYOPHYLLACEÆ.

Silene. Woods of Council grove.

HYPERICEÆ.

Hypericum ellipticum. August 11.

PORTULACEÆ.

Portulaca oleracea. By the road side from "Pawnee fork" to the crossing of the Arkansas.

LINACEÆ.

Linum rigidum. From "Pawnee fork" to "Arkansas crossing."

GERANICEÆ.

Geranium Fremontii. Occurs throughout the "Raton pass."

OXALIDACEÆ.

Oxalis violacea. Near Council grove.
stricta. From Kaw river to Council grove.

ANACARDIACEÆ.

Rhus Glabrum. Bank "Kaw river" and Wakaroosa river.
radicans. Woods at "Big John spring."
near R. aromatica. August 13.

MALVACEÆ.

Sphæralcæa stellata, *Torr. and Gr.* "Raton pass" and "Rio Cañadian."
Sida coccinea. Arkansas river and El Rio Cañadian.
Malva pedata. Cotton-wood fork and bottoms of Arkansas river.
Sida, (new species.) August 17.

VITACEÆ.

Vitis æstivalis. Along the Arkansas river and Purgatory creek.
riparia. Stranger creek.
vulpina. 110 Mile creek.

RHAMNACEÆ.

Ceanothus ovalis, *var. intermedia*, (*Torr. and Gr.*) Kaw river and Council grove.
Americanus. Fort Leavenworth.

ACERACEÆ.

Acer negundo. Banks of Pawnee fork.

LEGUMINOSEÆ.

Astragalus. Bent's Fort and Ocaté creek.
Glycyrrhiza glabra. Arkansas river.
Gymnocladus Canadensis. Kaw river.
Petalostemum, (new species.) At "Ojo Vernal."
Psoralea esculenta. "110 Mile creek," and along the Arkansas river.
Robinia pseudo acacia. Purgatory creek, near the Raton pass.
Baptisia leucantha. As far as Pawnee fork.
Cassia chamæcrista. First seen July 3, thence to the Arkansas crossing.
Petalostemum candidum. High prairies, as far as Bent's Fort.
violaceum. With the preceding.
Psoralea floribunda. Pawnee fork.
Dalea laxiflor. With the preceding.
Lathyrus linearis. August 9.
Amorpha canescens. Fort Leavenworth to Pawnee fork.
Schrankia uncinata. Stranger creek to Arkansas crossing.
Darlingtonia brachyloba. Pawnee fork and 110 Mile creek.
Glycyrrhiza lepidota. August 13.
Cereis Canadensis. Kanzas river.

ROSACEÆ.

Cerasus Virginiana. Kanzas river, Arkanzas river, and Purgatory creek.
Fragaria Virginiana. Kaw river.
Rubus occidentalis. Missouri river and Kaw river.
villosus. With the preceding.
Prunus Americana. Pawnee fork, Arkansas river, and Cañadian river.
Cratægus coccinea. Stranger creek.
Rosa lucida. Kaw river.

ONAGRACEÆ.

Œnothera. Several species occur from Kaw river to Bent's Fort.
Gaura coccinea. August 13.

LOASEÆ.

Mentzelia nuda. Bent's Fort and valley of the Timpas.

GROSSULARIACEÆ.

Ribes aureum. Purgatory creek and Timpas, near its head.
triflorum. Diamond spring.

CACTACEÆ.

Opuntia Missouriana. Pawnee Fork, Purgatory creek, and Cañadian river.
Mammillaria sulcata. Near Pawnee fork.

CORNACEÆ.

Cornus paniculata. Big John spring.
stolonifera. Stranger creek.
Florida. Kaw river.

CAPRIFOLIÆ.

Symphoricarpus glomeratis. Purgatory creek.
occidentalis. With the preceding.
racemosa. Big John Spring.

UMBELLIFERÆ.

Sium latifolium. Diamond spring.
Angelica. Head water, Purgatory creek.
Eryngium aquaticum. Near Wakaroosa creek.

RUBIACEÆ.

Galium tinctorium. Ponds near Lost spring.
Cephalanthus occidentalis. Stranger creek.

COMPOSITÆ.

Senecio (near) palustris. Raton.
filifolius. Bent's Fort to Santa Fé.
Rudbeckia columnaris. Fort Leavenworth to Arkansas crossing.
hirta. Lost spring to Jackson's grove.
Erigeron strigonium. Pawnee fork.
Eupatorium purpureum. Turkey creek, Arkansas crossing, and Bent's Fort.
Grindelia squarrosa. Arkansas river, near the crossing.
Solidago altissima. Bent's fort.
Solidago. Cotton-wood fork.
Liatris spicata. Crossing of the Arkansas river.
squarrosa. Plum buttes.
Silphium laciniatum. From Fort Leavenworth to Cotton-wood.

Coreopsis tinctoria. Turkey creek to Bent's fort.
Asters, (two or three species.) With the preceding.
Gaillardia amblyodon. Plum buttes, and on the Moro.
pinnatifida. With the preceding. (Leaves lanceolate.)
Helianthus heterophyllus. Abundant from Coro creek to Santa Fé.
dentatus. At San Miguel.

ERICACEÆ.

Arctostaphylos uva ursi. Council grove.

LOBELIACEÆ.

Lobelia leptostachya. Cotton-wood fork.
cardinalis. Bent's fort.

CAMPANULACEÆ.

Campanula rotundifolia. Raton pass.

OLEACEÆ.

Fraxinus Americana. Ash creek.

APOCYNACEÆ.

Apocynum androsæmifolium. Lost spring.

ASCLEPIADACEÆ.

Asclepias verticillata. Stranger creek and Pawnee fork.
tuberosa. Fort Leavenworth to Cotton-wood fork.

CONVOLVULACEÆ.

Ipomœa leptophylla. Walnut creek to the Canadian river.
Cuscuta Gronovii. In the bottoms near the "caches."
Convolvulus. (Near sepium.) August 14.
Euploca convolvulacea. Raton pass.

BORAGINACEÆ.

Myosotis glomerata. Arkansas river, near caches.

POLEMONIACEÆ.

Gilia (cautua) longiflora. Raton pass.

LABIATÆ.

Hedeoma leptophylla. Near crossing of Arkansas.
Monarda fistulosa. Near caches.
allophylla. 110 Mile creek; Cotton-wood fork.
Mentha piperita. Bent's fort.
Salvia azurea. Arkansas bottoms and New Mexico.
Teucrium Virginicum. Pawnee fork.

SOLANACEÆ.

Solanum nigrum. Bent's fort.
triflorum. Arkansas river, near crossing.
Nycterium lobatum. From the caches to Bent's fort.
Physalis lanceolata. Near Bent's fort. August 4.

GENTIANACEÆ.

Eustoma Russelliana. Bottom of Arkansas and Canadian.

SCROPHULARIACEÆ.

Pedicularis canadensis. Near Pawnee fork.

CHENOPODIACEÆ.

Chenopodium album. From Fort Leavenworth to crossing.
Fremontia vermicularis. Purgatory creek and Timpas.
Artemisia. Purgatory creek.
Obione canescens. Valley of the Timpas.
Salicornia herbacea. Arkansas river crossing.
Eurotia lanata. Rio Canadian to Santa Fé, and sout[illegible]

VERBENACEÆ.

Verbena pinnatifida. Rio Canadian and Rio Rayado.
angustifolia. Little Arkansas river.
Lippia cuneifolia. From Pawnee fork to Santa Fé.

CUCURBITACEÆ.

Cucumis perennis. From Walnut creek to Santa Fé.

NICTAGINEÆ.

Oxybaphus, (new to me.) *Torr.* Slender branching spea
"Rio los Animas."
—— nyctaginea. Raton and "Rio Canadian."

POLYGONACEÆ.

Eriogonum. *N. sp.* Walnut creek.
tomentosum. Council grove.
Polygonum, (long lacerated sheaths, no flowers.) Walnut creek.
amphibium. Turkey creek.

LAURACEÆ.

Laurus benzoin. Kaw river and Council grove.

EUPHORBIACEÆ.

Euphorbia marginata. Pawnee fork to Bent's fort.
hypericifolia. Turkey creek.
? By the road side, near the "caches," and in the Buffalo wallows.
Croton capitatum. Crossing of the Arkansas river.

URTICACEÆ.

Humulus lupulus. Raton pass and Canadian river.
Morus rubra. Council grove and Kaw river.
Urtica canadensis. Kaw river and Stranger creek.

ULMACEÆ.

Ulmus Americana. Pawnee fork.
Celtis crassifolia. Woods at Council grove.

AMENTACEÆ.

Salix longifolia. Council grove, 110 Mile creek.
(no flowers or fruit.) Arkansas river.
Populus monilifera. Timpas, at head of Purgatory creek.
canadensis. From Kaw river to Santa Fé.
(new to me.) *Torr.* Rio Canadian.
Salix augustifolia. Arkansas river.

CONIFERÆ.

Juniperus Virginiana. Timpas, and from Purgatory creek to Santa Fé.
(different from Virginica.) *Torrey.* Near Santa Fé.
Pinus monophyllas. Raton Pass to SantaFé.
rigida. As above.

MONOCOTYLEDONOUS OR ENDOGENOUS PLANTS.

ALISMACEÆ.

Sagittaria sagittifolia. Head of Timpas.

MELANTHACEÆ.

Melanthium Virginicum. Stranger creek and Wak[illegible]osa river.

LILACEÆ.

Yucca angustifolia. From Bent's fort to "Fra Cristobal."
Lilium tigrinum. Wakaroosa river.
Alluim vineale? Raton pass.

JUNECEÆ.

Juncus tenuis. Raton pass.

COMMELINACEÆ.

Tradescantia Virginica. Fort Leavenworth to "110 Mile creek.
rosea. With the preceding.
Commelina angustifolia. Pawnee rock and Raton pass.
N. sp. (long acuminated spatha.) Raton.

SMILACEÆ.

Smilax rotundifolia. Kaw river, Council grove, and 110 Mile creek.

CYPERACEÆ.

Scirpus triqueter. Low grounds near Arkansas crossing.
atrovirens. Pawnee fork.
Cyperus filiculmis. Little Arkansas.
Carex festucacea. Wakaroosa river.

GRAMINEÆ.

Arundo phragmites. Arkansas, Timpas, and Canadian rivers.
Sesleria dactyloides. Pawnee fort to Bent's fort.

Agropyrum. Stranger creek.
Atheropogon olygostachium. Canadian river.
Koeleria nitida. Pawnee fork.

EQUISETACEÆ.

Equisetum hyemale. Near crossing of the Arkansas.

APPENDIX No, 7.

WASHINGTON, *December* 6, 1847.

SIR: I have the honor, at your request, to address you a brief memoir on the subject of the district of country in Sonora, Mexico, which I passed over in November and December last, with a wagon train, when I deviated, in search of a practicable route, from the mule trail of Brigadier General S. W. Kearny, on his march from New Mexico to California.

When he turned off from the Rio Grande, opposite the copper mines and the heads of the Gila river, I kept the river for thirty miles to the south, and making a southern bend, turned again towards the north, and struck his route (as surveyed by Mr. Emory of your corps) just above the village of the Pimo and Maracopa Indians, an estimated distance of 444 miles.

Immediately below the point of deviation, on the Rio Grande, the country bordering the river became sensibly flatter and less broken. I left the river when in view of a point marked on the common maps as "San Diego," and the distant view towards "El Paso" proved the country to be unbroken and comparatively level.

From the high valley of the river I ascended to the *table land* of Mexico, by an almost insensible slope over *smooth* prairie. For 150 miles on this smooth level table land, which is studded with isolated hills or mountains, I journeyed without any difficulty, passing over but three hills, in two cases, I know, in the third, I believe, unnecessarily. I then, unexpectedly and suddenly, arrived at a great break off to a lower level of country, the descent to which was very broken and rough mountains for fifteen miles. I found, however, that I had at that moment fallen into an old wagon trail, which led, I was told, from Yanos. I was able to get my wagons through, following a stream all the way, and descending in the 15 miles possibly a thousand feet. This was the head of the Huaqui river, which empties into the California gulf. I was told that this was called the Pass of Guadaloupe.

I then passed an unbroken country, about 80 miles, when I fell upon the José Pedro river, which empties into the Gila. I descended this without difficulty of ground about 80 miles. In turning off there is an ascent to nearly level country of, perhaps, above an hundred feet, but it could be made very gradual. It is then about 48 miles to Tueson, a town of about 500 inhabitants, with a fort and garrison. This distance is over much smooth ground, maintaining the same general level. Tueson is in a rich and well cultivated valley, where there is also a dense forest of *maguey*. From Tueson it is some 75 miles to the Gila. It is a level plain, generally of clay, where my wagons and footmen (water being very scarce) passed at the rate of about 30 miles a day.

On the map which I made, and which is in your bureau, is marked a route considerably to the north of Guadaloupe pass, which, some of my guides believed, would avoid that broken descent, and be found to be nearly level throughout to San Pedro, a the point where I turned off from that beautiful little river. The most sensible and experienced of these men, Laroux, who lives in Taos, New Mexico, and who had trapped on the Gila and passed in a different direction over that country, was decidedly of this opinion, but his knowledge, on the other hand, was sufficient to forbid to explore it, in my situation, on account of scarcity of water.

The Rio Grande bottoms for a hundred miles above, and at the point where I left, are well timbered; there is no timber on the table land, save upon the small mountains which are everywhere to be seen; this is cedar and pine, but of small growth. Rock i everywhere to be had, secondary rocks of almost every kind; bu by this wonderfully level route, the continent may be passed wit scarcely a view of granite. As far as Tueson the grama grass i abundant; it will fatten cattle while working, and in winter. Th route from Tueson passes through a country abounding in exceedingly rich gold mines.

I am, very respectfully, sir, your obedient servant,

P. ST. GEO. COOKE,
Major 2d dragoons.

To Col. J. J. Abert,
Topographical Engineers.

Dec. 12 1930

Dec. 12 1930